

MINING TAXATION IN COLOMBIA^{†‡}

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SUMMARY

This paper first assesses the current Colombian mining tax-and-royalty regime in comparison with other countries from the points of view of efficiency, competitiveness and revenue performance. It then discusses the theoretical convenience of introducing alternative designs for a resource rent tax (RRT) to be applied to new mining projects, together with a reduced common royalty rate for all minerals, and simulates their potential efficiency, competitiveness and revenue-performance effects. In particular, it examines alternative interactions between the RRT, the royalty regime and the corporate income tax (royalties creditable against the RRT or deductible from its tax base; accepting or not corporate income tax deductibility from the RRT tax base), under alternative RRT tax rates. It also discusses alternative capital return allowances and the pros and cons of project-by-project versus sectorial ring fencing, and sharing RRT revenues between the national and sub-national governments. It concludes with a detailed blueprint for reform based on these discussions, assessments and simulations, as well as political economy and administrative considerations for the specific case of Colombia.

Este trabajo evalúa la eficiencia, competitividad y capacidad de recaudo del régimen tributario y de regalías colombiano en comparación con el de otros países mineros relevantes. Posteriormente, propone la implementación de un “Resource Rent Tax” (RRT) para proyectos mineros futuros (junto con una reducción y unificación de la tasa de regalías entre minerales) y modela el impacto que tendría éste sobre la eficiencia y el recaudo. Se examinan la interacción entre el RRT, las regalías y el impuesto de renta bajo distintos diseños y tasas de RRT y costo de oportunidad del capital. También se analiza si es preferible tener “ring-fencing” a nivel de proyecto o a nivel sectorial. El trabajo concluye con una propuesta de reforma junto con consideraciones administrativas y políticas para una exitosa implementación.

[†] We thank Eduardo Garcia and Pedro Jimenez, from Universidad de Los Andes, for excellent research assistance. We are in debt to an anonymous referee for his insightful comments. We also thank the Agencia Nacional Minera, the Superintendencia de Sociedades, the Superintendencia Financiera and the Asociacion de Minería a Gran Escala for their generous access to their public access records. We also thank these institutions and DIAN officials for clarifications about the interpretation of legal and contractual provisions.

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[‡] This research was financially supported by the Government of Canada via a partnership with Western Economic Diversification.

RÉGIME FISCAL MINIER EN COLOMBIE^{†‡}

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SOMMAIRE

L'exposé qui suit commence par une évaluation du présent régime colombien des impôts et redevances miniers en comparaison avec celui d'autres pays des points de vue de l'efficacité, de la compétitivité et de la génération de revenus. On y discute ensuite de la commodité théorique de l'instauration de conceptions de remplacement pour une taxe sur les bénéfices des ressources (TBR) à appliquer aux projets miniers, en conjonction avec un taux de redevances commun réduit pour tous les minéraux, et on y simule leurs effets potentiels sur l'efficacité, la compétitivité et la génération de revenus. On y examine en particulier les possibles interactions entre la TBR, le régime de redevances et l'impôt sur le revenu des sociétés – redevances donnant droit à un crédit à l'égard de la TBR ou déductibles de l'assiette d'imposition; acceptation ou non de la déductibilité de l'impôt sur le revenu des sociétés de l'assiette d'imposition TBR – dans le cadre de différents taux d'imposition TBR. On y discute également des crédits sur le rendement du capital, du pour et du contre de l'isolement projet par projet par rapport à l'isolement sectoriel, ainsi que du partage des revenus de la TBR entre les gouvernements nationaux et infranationaux. L'étude se conclut par un plan détaillé pour une réforme basée sur ces discussions, évaluations et simulations, ainsi que sur des facteurs d'économie politique et administratifs pertinents pour le cas particulier de la Colombie.

[†] Nous remercions Eduardo Garcia et Pedro Jimenez, de l'Universidad de Los Andes, pour leur excellente aide à la recherche. Nous sommes redevables à un réviseur anonyme pour ses judicieux commentaires. Nous remercions également l'Agencia Nacional Minera, la Superintendencia de Sociedades, la Superintendencia Financiera et l'Asociación de Minería a Gran Escala pour l'accès qu'ils nous ont généreusement accordé à tous leurs registres accessibles au public. Nous remercions aussi tous les établissements et représentants de la DIAN (Dirección de Impuestos y Aduanas Nacionales de Colombia) pour leurs éclaircissements relativement à l'interprétation des dispositions légales et contractuelles.

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[‡] Cette recherche a été soutenue financièrement en partie par le gouvernement du Canada via Diversification de l'économie de l'Ouest Canada.

1. INTRODUCTION

Mining has grown in importance in the Colombian economy. The annual production of coal increased from less than five million tons in the early 1980s to 89 million tons in 2012. Similarly, from 1990 to 2012, both nickel and gold production more than doubled. As a share of GDP, mining increased from less than 1.8 per cent before year 2000 to around 2.3 per cent from 2005 onwards. Mining exports increased from around 10 per cent of total exports in 2000 to a peak of 25 per cent in 2009, and have stayed above 20 per cent since then, due both to increased production and high export prices. As a result, royalties and taxes from mining activities, as a share in total government revenue, increased from less than one-half per cent in 2000 to over 1.6 per cent in 2011.

However, Colombia is far from reaching its relatively significant mining potential.¹ Policy debates and lack of government co-ordination have so far impeded the country from taking advantage of its potential growth in mining in an environmentally sustainable and socially sound way. Although the most acrimonious part of the debate has referred to the environmental and social consequences of mining, there have also been voices asking for a higher government take through either higher royalties or a special export tax, and several congressional initiatives in recent years were oriented towards increasing royalty rates.

This Colombian story is part of a global trend. From 1990 to 2012, global mining exports grew more than fivefold, and their share of total merchandise exports increased from 3.6 to 4.4 per cent.² During the same period, commodity prices also went through full cycles of swings.³ As a result, the policy debate around mining taxation heated up in almost all resource-rich democratic countries: at the peak of price escalation, the debate was focused on how big (and how progressive) a profit share a host government should obtain from investors; and when the bust occurred, more cautious notes erred on the side of preserving mining investment.⁴

Therefore, the most pressing issues in mining taxation today appear to be centred on how much and in what manner the government should tax the cyclical “windfalls” associated with the mining industry without jeopardizing either the industry’s short-term growth or long-term sustainable development. It is within this context that the concept of a resource rent tax (RRT) has again caught the attention of policy-makers around the world, as it would permit a high government share in the windfalls without impairing investment prospects. An RRT approximates the theoretical optimal tax base by targeting revenues in excess of all current and capital costs of mining, including a “normal” rate of return to capital invested in either mining or non-mining industries. By taxing only the rent from mining, even to the fullest extent, in theory it would not distort investment allocation; and it would also reflect the principle of equity in taxation according to which tax is based on “ability to pay.”

¹ According to The Fraser Institute’s *Annual Survey of Mining Companies* (2012/2013), should Colombia adopt the industry’s best practices and assuming no regulations, its mining potential, as ranked among 96 mining jurisdictions, could be improved from the current 40th rank to the 21st.

² Our estimate based on www.stat.wto.org.

³ Refer to <http://www.infomine.com/investment/metal-prices/>.

⁴ For a full account of the recent history in resource taxation amid boom and bust, refer to Bryan C. Land, “Resource rent taxes: a re-appraisal,” *The Taxation of Petroleum and Minerals: Principles, Problems and Practice*, ed. Philip Daniel et al. (International Monetary Fund, 2012), Section 2.

Reality, however, is not so straightforward. There are two principal practical concerns against introducing an RRT in lieu of conventional (revenue-based) royalties.⁵ They are: revenue stability and administrative efficiency

First, since the rent from minerals arises only when accumulated revenues reach a level that is more than sufficient to cover the accumulated cost of mining, the government would only begin to receive revenues from an RRT after multiple years of production in new projects. In addition, given the wide cyclical fluctuations that characterize commodity prices, government revenues from a mining RRT would be highly volatile. These traits would probably make an RRT politically unacceptable as the only form of mining taxation over and above general income tax and indirect taxes, given the fact that government revenues represent a significant fraction of potential domestic benefits from mining activities.⁶ Taking into account these considerations, most proponents of an RRT suggest combining it with a revenue-based royalty, though keeping the latter at a relatively low value to avoid high efficiency costs. Further, it can be argued that taking into consideration political risk, and hence investor concerns about the stability of the tax regime, such a combination may indeed approximate an optimal tax, both from the point of view of the government and the investor.⁷ After all, investment responds both to expected returns and risks, including political risks.

And second, as resource rent is calculated in a cumulative manner before the payout point, implementation of an RRT requires diligent bookkeeping and a more sophisticated tax administration than is required to administer a unit-based royalty system. In other words, the economic efficiency associated with an RRT may have costs in terms of the administrative efficiency of taxation. However, tax administrations in countries such as Colombia are used to dealing with complex inter-temporal issues in the administration of corporate taxes in oil, mining and infrastructure construction, and highly complex issues in other activities such as finance. It is true, as we discuss later on, that Colombia and other developing countries have serious difficulties in dealing with transfer prices. This is a common problem for administering an RRT, a corporate income tax or a revenue-based royalty (though in the Colombian case, the government sets the base price for the calculation of royalties following international prices and, thus, largely bypasses the transfer-pricing problem). Such countries also have difficulties with complex financial products, such as derivatives, often used by the industry, which are a common problem for administering an RRT or a corporate income tax. Therefore, the potential administrative challenges associated with a mining RRT are in principle not significantly higher than those encountered in the current administration of corporate income taxes. That said, the ring-fencing recommendations included at the end of this paper may create significant additional administrative

⁵ Throughout this paper we adopt the conventional use of the term “royalty” to mean a revenue-based ad valorem levy, such as the existing mining royalty in Colombia. The “revenue” here means sales value or production value that is often net of transportation and distribution cost to form the royalty base. There are other forms of mining royalties, such as a specific unit-based levy at specific amounts, which might be the easiest to administer but is the least efficient among all major royalty and tax instruments targeting the mining industry. We do not consider here this type of specific unit-based royalty due to its high efficiency costs and the fact that it is less popular in countries with relatively advanced institutional settings, such as Colombia. For a complete “qualitative assessment of the performance of various royalty/taxation types with regard to the government’s main fiscal objectives,” refer to Pitro Guj, “Mineral royalties and other mining specific taxes,” (International Mining for Development Centre, 2012), particularly Figure 2, http://im4dc.org/wp-content/uploads/2012/01/UWA_1698_Paper-01_-Mineral-royalties-other-mining-specific-taxes1.pdf. Further, some authors deem a mining “royalty” any fiscal levy by the government targeting only the mining industry that represents a payment to the resource owner for the right to take ownership of its property. Following this logic, the resource rent tax to be discussed and proposed in this paper would be a form of mining royalty. For reasons of clarity of exposition, when we refer to royalties here we mean conventional revenue-based ad valorem royalties.

⁶ Other such potential domestic benefits arise mainly from potential backward and forward industrial and service linkages that can generate greater employment and national income, including government revenue.

⁷ See, in particular: G. Perry and S. J. Ho, “The effects of commodity taxation on sector performance,” *IDB Working Papers* (2012); J. Otto et al, *Mining Royalties, A Global Study of Their Impact on Investors, Government, and Civil Society* (The World Bank, 2006); David Johnston, Daniel Johnston and Tony Rogers, *International Petroleum Taxation* (Daniel Johnston & Company, 2008); and IMF, “Fiscal regimes for Extractive industries: Design and Implementation,” *IMF Working Papers* (August 2012).

difficulties, which should be weighed carefully before the recommendations are adopted. In summary, what needs to be borne in mind while designing an RRT is a good compromise between simplicity and effectiveness of control of tax-elusion practices: a common criterion used in general tax design.

For tax efficiency and revenue potential, particularly during periods of high prices, we believe Colombia would benefit from a resource rent tax (RRT) targeting its mining (as well as its oil) industry. However, for the successful introduction of such a tax (i.e., with easy acceptance by both the public and mining investors) and sustainable implementation of an RRT, policy-makers need to pay special attention to possible pitfalls, including the aforementioned concerns. We also are mindful that the current revenue-based royalty for particular mining projects might have brought in rather high revenue in relation to profit, as a combined result of a high royalty rate and a rather low profit margin (e.g., in the case of the largest coal projects). We examine these issues in some detail in the text.

Therefore, after this introduction, we shall first discuss the main issues concerning the general design of an RRT, so as to outline the RRT structure that may suit Colombia and other countries in similar situations. In the subsequent three sections we shall provide, in sequence, an overview of Colombia's mining fiscal regime, a comparative analysis of this regime in terms of its tax efficiency, cross-border tax competitiveness and revenue performance, and propose a resource rent tax that is based on our conceptual discussion in Section 2 and assessed through efficiency and revenue simulations. The final section concludes our study.

2. RESOURCE RENT TAX: SOME DESIGN ISSUES

A resource rent tax (RRT) is commonly defined as a tax based on the rent generated from resource extraction that exceeds any “nominal” return to capital. Although the concept of an RRT has only recently appeared to be popular among policy circles, the first adoption of such a tax can be traced back to the government of Papua New Guinea in 1977, and dozens of jurisdictions have since adopted a form of RRT.⁸ In fact, all Canadian provincial mining taxes possess some features of an RRT (e.g., allowing most asset expenditures to be fully expensed while disallowing financing costs).⁹ It is true, however, that not all RRTs were introduced without fierce controversy and a few of them did not last long. The most noticeable news stories on RRT were about the recent introduction and repeal of the mining resource rent tax (MRRT) in Australia within three years.¹⁰ This notwithstanding, more governments are contemplating an RRT for their mining industries. These diverse country experiences with an RRT suggest that there is no “one-size-fits-all” approach to mining taxation. Even a theoretically sound tax instrument like an RRT needs to be carefully designed and harmonized with other aspects of the tax system to suit country-specific economic and institutional settings.

Some of the most pressing issues around introducing an RRT in Colombia appear to be the following:

1. How should an RRT interact with the conventional royalty and corporate income tax?
2. Who has the taxing power and how should RRT revenue be distributed?
3. How to structure the RRT in terms of its rate and progressiveness?

⁸ For a list of some RRT examples, refer to Table 8.1 in Land, “Resource rent.”

⁹ For a recent assessment of the Canadian mining tax system, refer to D. Chen and J. Mintz, “Repairing Canada’s Mining-Tax System to be Less Distorting and Complex,” *SPP Research Papers* 6, 18 (May 2013).

¹⁰ Refer to <https://www.ato.gov.au/Media-centre/Media-releases/ATO-provides-advice-on-MRRT-repeal/>. For a brief history of Australia’s MRRT, refer to http://en.wikipedia.org/wiki/Minerals_Resource_Rent_Tax.

4. How to scope ring fencing: for the mining activities as a whole, or by project?
5. What is the benchmark for setting the return allowance for carrying over RRT losses: the government long-term bond rate or the miner's financing cost?

We discuss these issues below in sequence. With our main concern being the principle of tax efficiency, we choose our answers carefully to reflect Colombian reality. When there is no handy answer that can be drawn from the existing literature or international best practice, we make our judgment based on Colombian political economy or err on the side of administrative efficiency.

The Interaction of RRT with Other Government Levies

Current mining taxation in Colombia includes a corporate income tax and a revenue-based royalty, with the royalty being deductible for income tax purposes. How should an RRT interact with these two existing levies on mining business?

RRT and conventional royalties. As discussed above, revenue stability concerns suggest that a revenue-based royalty should be preserved as a minimum annual payment from mining, on top of CIT tax liabilities that, ideally, should tax all economic activities in a neutral way. However, present royalty rates for some mining activities are too high and impose severe efficiency costs (see sections 3 and 4 for further discussion). Superimposing an RRT on them would lead to overtaxation and underinvestment in some activities. Thus, the introduction of a mining RRT in Colombia should be accompanied by a reduction of royalty rates to a common minimum across minerals (e.g., three to five per cent), which would not impose severe efficiency costs, while preserving a minimum revenue flow to government coffers from production starts in any project. The present complex royalty system in Colombia, with different regimes and rates per mineral (see a full description in Section 3), appear to have little rationale, other than having resulted from past political negotiations. Further it has created major distortions across minerals and between different projects, as Section 4 shows.

Royalty payments may be carried over, along with other RRT losses and uplifted by the prescribed return allowance, so as to be deducted from the ultimate RRT base. Alternatively, the accumulated royalty payments may be credited against the RRT payable in future. In the latter case, the ultimate levy of the government as the owner of mining resources is the RRT, a tax based solely on the resource rent; and the revenue-based royalty functions only as a revenue stabilizer, or minimum payment, during the years when the RRT payment falls below such a minimum royalty payment. As a consequence, and as will be shown in Section 5, crediting royalties against the RRT would permit a significant gain in terms of allocative efficiency across mining activities, as it would equalize the marginal tax and royalty rate on investments across them.

Deducting a common minimum royalty on all mining activities from the RRT base would not achieve this goal, though it would certainly reduce present distortions on marginal investments across mining activities. That said, revenue goals would require a higher RRT rate if royalties are credited against future RRT payments instead of being deductible from the RRT base. Thus, for example, estimates presented in Section 5 indicate that, assuming full independence of the RRT and the CIT (see below), the present value of overall mining fiscal revenues in the last two decades would have been similar with a 40 per cent RRT that would have allowed full future crediting of a common minimum royalty of five per cent across mining activities, and a 25 per cent RRT that would have made such royalties deductible from the RRT base.

Should the CIT be deductible from a new RRT? A CIT that taxes profits from all economic activities at a common rate is actually taxing mining rents, together with normal returns on capital. In other words, there is a partial overlap of RRT and CIT tax bases.¹¹ Therefore, to avoid additional efficiency cost associated with the overlap of RRT and CIT bases, the revenue authority should allow CIT deduction from the RRT base. If this is done, the total marginal tax and royalty rate on mining activities would not depend on the rate of the RRT, as demonstrated in the Appendix and shown in the efficiency estimates in Section 4. Otherwise, total efficiency costs would increase with the rate of RRT, creating a trade-off between revenue and efficiency/competitiveness objectives.

However, allowing CIT deduction from the RRT may unduly complicate tax administration, not only due to bookkeeping requirements but especially because any legal dispute between the taxpayer and the tax administration on a CIT assessment would be immediately carried over to the RRT assessment. In addition, for revenue purposes, it would require an even higher RRT rate than the one required with an independent (from the CIT) RRT that allows full deduction of royalties. For the example given above with fully creditable royalties, the RRT rate would have to go up from 40 per cent for an independent RRT to around 50 per cent for one that allows CIT deductibility. The higher the required RRT rate (for similar revenue objectives) the stronger business and political opposition it may face, and the larger the incentives it would entail towards “creative accounting” and hence the higher the administrative efforts it would imply.

Taxing Power and Revenue Sharing

Due to the great variety of government fiscal structures across countries, there is no single RRT formula acceptable to all jurisdictions for rent sharing between the miner and the government. For example, in unitary fiscal states such as Norway and the United Kingdom, taxes and royalties, regardless of their statutory structure, are designed and collected by the national government. In such a unitary tax system, a form of rent-based tax can be simply an add-on to the general corporate income tax with a few alterations tailored to the resource industry.¹² Obviously, such a simple and rather efficient and effective taxing instrument requires solving difficult issues of tax co-ordination and allocation of proceeds in federal countries where mineral resources are often owned by the sub-national governments. In these countries, inter-governmental revenue sharing is often a headache even without a rent-based tax. Colombia poses an interesting and highly complex intermediate case, as it is a unitary state where mineral resources are owned by the national government, but royalty revenues are fully distributed among sub-national entities. Though this poses significant revenue-sharing and political economy issues, to be discussed below, they appear to be less difficult to solve than those arising in federal countries.

A mining RRT would be established by the national Congress in Colombia, as has been the case with conventional royalties. This is a consequence of the fact that Colombia is a unitary republic and ownership of mining resources belongs to the national state. However, Congress may determine that revenues from the RRT be shared between the national government and sub-national governments.

In many other unitary countries, royalties are also shared with sub-national governments where production is located. Colombia is however an unusual case in this respect as, by recent constitutional reforms, royalty revenues are fully distributed among sub-national governments and they are shared between producing and non-producing sub-regional governments. Indeed, the new constitution adopted in 1991 maintained the share of royalties for producing regions and municipalities that had been awarded by previous laws, and determined that the rest would go to a National Royalty Fund in order to finance

¹¹ See J. Mintz and D. Chen, “Capturing Economic Rents from Resources through Royalties and Taxes,” *SPP Research Papers* 5, 30 (October 2012).

¹² For a brief summary of the rent-based taxes in Norway and the United Kingdom, refer to Mintz and Chen, “Capturing Economic,” Table 1.

regional projects proposed by any sub-national government. Later on, a constitutional amendment in 2011 reduced the share of producing regions and determined that remaining royalty proceeds would be distributed in fixed proportions among all regional governments (departments), through three different funds, each with its own distribution rule. We compare the current and previous distribution of royalty proceeds in Box 1. This institutional setting complicates significantly the political economy of the proposed reform.

Box 1: Constitutional Reform on Distribution of Royalty Proceeds

Prior to 2011, the Constitution stated that 80 per cent of royalty proceeds had to go to provincial governments in producing regions (as direct royalties), and the remaining 20 per cent to the National Royalty Fund. Direct royalties were divided between producing municipalities and provincial governments, with shares of 23 per cent and 50 per cent respectively, and port municipalities, with a share of seven per cent. The 2011 constitutional reform drastically reduced direct royalties to 20 per cent of total royalty proceeds (while leaving the distribution between producing municipalities, provinces and ports unchanged), and created independent “regional royalty funds” for the remaining 80 per cent. Each Regional Royalty Fund is divided into a Regional Compensation Fund, which focuses resources on the poorest municipalities, and the Regional Development Fund, which aims to finance regional development and infrastructure projects. A three-year transitional regime, summarized in the following table, was established to mitigate political opposition to the reform:

Year	2011	2012	2013	2014	2015
Direct Royalties	80%	50%	35%	25%	20%
National Royalty Fund/Regional Royalty Funds	20%	50%	65%	75%	80%

As already mentioned, the establishment of an RRT should be accompanied by a reduction of the traditional royalty rates to a common minimum across minerals (say, three to five per cent), to avoid overtaxation of some activities and to reduce the high inefficiency costs of the present regime. The simplest way of achieving this within the particular institutional setting in Colombia would be to establish an RRT as a substitute for the present royalty regime, legally established as the new royalty regime, with a minimum annual payment equivalent to three to five per cent of mine-mouth value of production. Thus, its revenues would be distributed according to present rules of distribution for royalty revenues, facilitating the support of regional representatives in Congress. However, it seems unlikely that the national government, which would have to present the draft law and lead the parliamentary discussion,¹³ would engage in a difficult and potentially costly political debate while not receiving any direct revenue benefits from such an initiative. Even more, if legally deemed a “royalty,” RRT revenues would in this case be fully deductible from the national income tax (unless the income tax law is simultaneously modified), and might result in a reduction of national government revenues from the income tax for the most profitable ventures, and in periods of high prices, from what they would have been under the present regime.

On the other hand, establishing the RRT as a new national levy for present and future concessions, while reducing the traditional royalty rates for both, would be fiercely opposed by sub-national governments and regional representatives in Congress, especially by those from producing regions, which already saw their share of royalties reduced by the 2011 constitutional reform.

The way out of this conundrum could be a compromise along the following lines.

- The RRT would be established as a new national levy applying only to new mining concessions. At the same time, royalties would be fixed at a common rate of three to five per cent for all new

¹³ And decide to accept or veto the approved bill in the case of a new law, as it has veto powers over tax laws.

mining concessions and their proceeds would be fully credited against the RRT. In other words, the existing concessions would neither be subject to the to-be-introduced RRT nor benefit from a reduced royalty rate. In this way, sub-national governments would not face a reduction of present revenues as a consequence of this legal reform (revenues would of course continue to vary depending on the evolution of prices and production of existing concessions). Additionally, the risk of excessive taxation of present ventures (which could result from a congressional decision superimposing the RRT on the present royalty rates) could be avoided.

The new regime could also be applied to extensions of present concessions or expansion of their area of exploitation, by mutual agreement. If so, care should be taken with permitting deduction of recent investments that might not yet have been recovered. Such an option may, however, be administratively very demanding, and its administrative costs and risks must be weighted against potential efficiency and revenue gains, before adopting it.

- The proceeds from the RRT would be shared between the national government and producing regions. As mentioned above and as illustrated in Box 1, these regions suffered an important reduction in their share since 2012. Thus, they would be the most likely to fiercely oppose the reduction of royalty rates, even if they apply only to new concessions, as most producing regions have potential for new mining ventures.

The Level of the RRT Rate

No literature or RRT study has provided clear criteria for setting a proper level of an RRT rate, let alone explicitly recommended a justifiable RRT rate.

Even if the government accepts the notion of allocative efficiency associated with the RRT (i.e., an RRT up to 100 per cent would not distort domestic capital allocation, provided that it allows full deduction of CIT and crediting of royalty payments), we rarely see an RRT rate above 50 per cent around the world. The Norwegian government collects a 50 per cent “special tax” from its oil industry, which is essentially rent-based and where the industry is provided with a cash refund for tax losses resulting from exploration.

Reasons for avoiding an excessively high RRT rate may include the following:

- a) Actual RRTs can only approximate a “pure” resource rent tax;
- b) Cross-border capital mobility makes competitors’ RRT rates an effective benchmark, provided that investors face similar expected rates of return before taxes;
- c) The “efficient risk-sharing” argument (see below) does not support an excessively high RRT rate;
- d) As already mentioned, higher rates may give more incentives to creative accounting, and hence demand more administrative effort and lead to stronger business and political opposition;
- e) The ultimate rate level has to be set as a balance between government revenue needs, investment goals and the government’s view of political economy (e.g., on how to grow and distribute the economic pie).

We therefore will not recommend a specific RRT rate, but will illustrate the efficiency, competitiveness and revenue implications of alternative rates and structures (see Section 4). Naturally, the ultimate decision regarding the RRT rate will lie in the hands of the government and Congress.

Our analysis below, including both marginal effective tax-rate analysis and revenue simulations, indicates that, with a reduced five per cent revenue-based royalty as the minimum annual payment, being fully creditable from the RRT, a 45 to 50 per cent rate for an RRT that allows CIT deduction would pass any test of tax efficiency, maintain competitiveness vis-à-vis other potential destinations of mining investments, and produce reasonably more revenue to the government in Colombia in good times. However, as mentioned, such a structure would be administratively demanding and achieving such a high rate may be a hard political sale. With such considerations in mind, the government and Congress may prefer a lower-rate (35 to 40 per cent) RRT that does not allow for deductibility of CIT payments, even if such a structure would maintain some efficiency and competitiveness costs, albeit certainly significantly lower ones than those of the present tax and royalty regime.

Progressivity and Taxation Along the Project/Price Cycle

It is well known that both production-based and revenue-based mining royalties are regressive with respect to profitability because their royalty base includes the cost of mining. That is, for a given production- or revenue-based royalty rate, the higher the profitability (as measured by the price-cost margin), the lower the equivalent royalty rate based on profit. Therefore, introducing a rent-based tax such as the RRT in addition to the existing revenue-based royalty system would substantially remove such regressivity for the mining industry. This is particularly so if the existing revenue-based royalty is simultaneously reduced when an RRT is introduced. Perhaps more importantly, such a combination would enhance the performance of the tax system along the project cycle (taxing less the initial stages of production, when companies are just recovering their investment, and more the mature mines where investments have been recovered) and the price cycle (capturing a larger fraction of profit windfalls in periods of high prices, while taxing less during periods of low prices).

Should an RRT be multi-rated so as to achieve a greater progressivity (and sensitivity to the project and price cycle) corresponding to different levels of profitability? Among the existing mining regimes, we do see such greater progressivity being implemented through a few taxing models. The most complicated model has a progressive rate structure based on prescribed thresholds for profitability. It is marked by multi-tiered payout points that are associated with multi-tiered rates of return for netting out the cost of production and multi-tiered RRT rates: the higher the rate-of-return allowance that marks a payout point, the higher the rent-based tax rate beyond that payout point. (The offshore royalty regime in the Canadian province of Newfoundland and Labrador provides a classic example of such a complex model.) A much simpler progressive RRT structure normally exempts “smaller” miners whose rent, or “excessive profit,” does not exceed a prescribed threshold. (For example, under Australia’s repealed MRRT, annual mining profits below \$75 million were exempted from tax, which is said to have exempted 320 miners from this MRRT).¹⁴

Whether to enhance progressivity of taxation under an RRT is debatable. On the one hand, given that rent is the profit in excess of any normal rate of return to capital, taxing the rent to its fullest should not scare away investors. Therefore, enhancing progressivity under an RRT, which allows deductibility of CIT and full crediting of royalties, should be acceptable, since it is far from the government taking away all the rent, but instead varies the tax rate based on the level of rent generated by the miners.¹⁵ However, in the real world, if we agree that the government is much more risk averse than the investor, “then efficient risk-sharing requires that the more risk-neutral investors receive all the uncertain

¹⁴ Refer to http://en.wikipedia.org/wiki/Minerals_Resource_Rent_Tax.

¹⁵ For an expert discussion on progressive taxation of resource extraction, as a means of reconciling the economic interests of governments and investors, and its limited use, see Bryan Land, “Capturing a fair share of fiscal benefits in the extractive industry,” in *Transnational Corporations* 18, 1 (April 2009), http://unctad.org/en/docs/diaeiia20097a7_en.pdf.

return in exchange for payment of some fixed fee to the government.”¹⁶ In other words, “risk-sharing considerations argue against progressivity in many lower income countries.”¹⁷

An additional argument against a more progressive RRT in many lower-income countries is based on administrative efficiency and revenue stability. And, if the government chooses not to allow CIT deductibility for administrative or political economy reasons, according to our previous discussion, it should definitively not use a progressive rate structure, as in such a case the higher RRT marginal rates will entail greater efficiency and competitiveness costs due to the interaction of RRT and CIT tax bases.

Last but not least, our simulations reported in Section 5 indicate that it is very hard to choose, *ex ante*, the right profitability thresholds and marginal rates and it is likely that a progressive structure may end up taxing at either the lowest marginal rate or at excessive marginal rates most of the time.

The Scope of Ring Fencing

By concept, ring fencing is “a limitation on consolidation of income and deductions for tax purposes across different activities, or different projects, undertaken by the same taxpayer.”¹⁸ It is commonly accepted that, if there is a tax targeting only mining activity (or any other specific business activity), then such activity should be ring fenced from other business activities so as to prevent potential revenue loss to the government. The practical concern is regarding the scope for such a ring fence: should it be imposed along business lines within the company (i.e., mining versus non-mining), or by individual project? Note that our proposal is to apply an RRT only to new mining projects, acknowledging that distinguishing what is “new” is not easy to ascertain in particular situations, for example in a major expansion of an existing project.

The argument for ring fencing along business lines is mainly an “efficiency” concern. Under this view, overly restrictive ring fencing, such as that imposed on individual projects, may discourage companies from undertaking further exploration and development activities due to the inability to claim deductions for such activities on new projects. It may also encourage excessive tax planning through transfer pricing (i.e., shifting the cost into and the profit out of more profitable projects from less profitable ones). All these possible actions induced by project-based ring fencing can cause efficiency loss in both mining investment and tax administration.

The argument for project-based ring fencing is more concerned about “competitive neutrality.” As the argument goes, if the ring fence is around the mining activities rather than based on individual projects, then it would be easy for well-established companies to shelter their current rent under the new investment projects, which could effectively create an entry barrier for newcomers. However, if the to-be-introduced RRT is being applied only to new mining projects (see below), there will not be any “existing” RRT base even for well-established mining companies in the short run.

¹⁶ Refer to R. Boadway and M. Keen, “Perspectives on resource tax design,” in *The Taxation of Petroleum and Minerals: Principles, Problems and Practice*, ed. Philip Daniel, Michael Keen and Charles McPherson (International Monetary Fund, 2010).

¹⁷ *ibid.*

¹⁸ Peter Mullins, “International tax issues for the resources sector,” in *The Taxation of Petroleum and Minerals: Principles, Problems and Practice*, ed. Philip Daniel, Michael Keen and Charles McPherson (International Monetary Fund, 2010), 394.

On the other hand, if the to-be-introduced RRT is to be applied to both new and existing projects, then the rent being generated by the well-established miners is not the perceived profit but has to be calculated by netting out all the accumulated costs in the past, plus the prescribed return allowance. Otherwise such an imperfect RRT would be overtaxing existing projects as it would tax more than the economic rents.

However, another argument favouring project-based ring fencing also appears to be legitimate: the ring fencing based on a company's overall mining activity may induce excessive mining investment. That is, the company may expand its mining investment only to shelter its otherwise taxable rent.

Therefore, a practical compromise seems to be project-based ring fencing that allows cross-project expensing of unsuccessful exploration expenditures. The usual possible administrative complication that may arise from this approach is to manage the interaction between the company-wide ring fencing for income tax purposes and project-based ring fencing for RRT purposes. This would be another reason in favour of an RRT that is independent of the income tax calculation.

A potential issue arising from project-based ring fencing is how to allocate the company overhead among ring-fenced projects. For simplicity, a presumptive deduction may be provided for overhead costs based on a fixed percentage (e.g., 10 per cent) of operational costs.

That said, cases of major expansions would remain a difficult issue, as it is difficult to ascertain to what extent they should be treated as a "new mining project" and how to separate incremental costs and revenues.

The Rate of Return Allowance

There is a consensus that, for RRT purposes, a return allowance or uplifting factor, should be provided for accumulated RRT losses up to the point when the RRT becomes payable. The contentious debate is on whether such a return allowance should be based on the risk-free government long-term bond rate or a much higher rate that matches up the weighted cost of capital, or internal rate of return, used by the mining investors for analyzing investment feasibility.

A well-known proposition in the economics literature¹⁹ supports using the risk-free government long-term bond rate as the return allowance for carryover of RRT losses. The argument for this proposition is that, by allowing all mining costs to be fully expensed, the government effectively shares the investment risk in mining. For example, for a 30 per cent RRT that allows full expensing of all capital and current expenses, the government effectively shares 30 per cent of the investment risk in exchange for 30 per cent of the rent arising from such an investment. In other words, the risk premium from capital asset pricing models is reduced by the factor "one minus the tax rate."

As an illustration, we can compare two cases in which the RRT losses associated with a mining investment are treated differently but generate the same financial outcome. For simplicity, we assume the mining investment amounts to \$1,000 and is all in fixed capital (i.e., ignoring the intangible assets and recurrent labour cost and other expenses), the RRT rate is 30 per cent and the project lasts for exactly two years: investing all the \$1,000 in the first year and receiving total proceeds of \$1,100 in year two, which includes \$100 in rent income and sale of all the capital assets for \$1,000. We also assume that the government long-term bond rate (LTBR) is five per cent and the investor's risk-bearing internal rate of return (IRR) is 10 per cent.

¹⁹ See, for example, Roger Gordon and John D. Wilson, "Measuring the Efficiency Cost of Taxing Risky Capital Income," *American Economic Review* 79, 3 (1989): 427-39; and Institute of Fiscal Studies, *The Mirrlees Review: Tax by Design* (Oxford: Oxford University Press, 2011): chapter 17, <http://www.ifs.org.uk/mirrleesReview/design>.

In the first case, the government fully refunds the \$1,000 mining investment at the assumed RRT rate of 30 per cent in the first year and taxes the total proceeds of \$1,100 at the end of the second year. That is, the investor needs to put up only \$700 for the project in the first year but pays \$330 in RRT at the end of the second year; its after-RRT net income is \$70 ($=\$1,100 - \$330 - \700) and the government's net RRT revenue appears to be \$30 ($=\$330 - \300). In this first case, the investor is happy with the government's upfront refund and has no reason to require any return allowance. However, if the government long-term bond rate is five per cent, then the government's nominal RRT revenue of \$30 at the end of the second year actually nets only \$15 ($=\$330 - (\$300 \times 1.05)$). That is, the \$300 RRT refund provided to the investor at the end of the first year bears a borrowing cost of \$15 to the government through the second year.

And in the second case, the government does not provide an upfront refund for the RRT loss of \$300 but lets the investor carry the RRT loss into the second year. In this case, the government can only tax the rent income of \$100 net of a return allowance on the RRT losses carried forward. What should the return allowance be? If the return allowance is the five per cent LTBR, then the government's net RRT revenue is also \$15 ($= (\$100 \times 30\%) - (\$300 \times 5\%)$), which is the same as in the first case. However, if the return allowance is set at the investor's 10 per cent IRR, then the government will collect no RRT despite \$100 in rent income accruing to the investor. In other words, the government would be better off by refunding the RRT losses upfront to the investor if it has no cash-flow concerns, which is equivalent to the five per cent long-term bond rate borne by the government.

In summary, by allowing all mining costs—ranging from exploration, development and depreciable capital to any current expenses—to be expensed for RRT purposes, the government is effectively sharing the investment risk proportionally based on the RRT rate. (This is also the justification that, for a rent-based tax, no financial cost is deductible.) Then what is truly carried over is the government RRT loss that should be compensated only by the government long-term bond rate.

Proposal for Colombia

Bearing in mind all the above design issues, we would envisage a resource rent tax for countries such as Colombia that would include the following key points:

- The RRT base is the accumulated revenue net of accumulated cost of mining, which includes all the current expenses and capital expenditures on both tangible and intangible assets (and thus excludes financial costs and revenues).
- The RRT will be applied only to new mining projects.
- The RRT is imposed by the central government with a single tax rate chosen by the government and preferably with the revenue-based royalty fully creditable against the RRT.
- The revenue-based royalty is preserved for future mining projects with a common rate for all minerals of no more than five per cent.
- Ideally, for efficiency and competitiveness reasons, the RRT should allow CIT deductibility. But this would require a higher RRT rate in order to obtain similar revenue objectives, which may be less politically viable, and more administratively demanding. The government may need to trade-off administrative ease and political viability for some efficiency and competitiveness costs.

- The RRT loss, including the carryover of the accumulated royalty payments, is carried forward at the government long-term bond rate (LTBR);
- The RRT will be ring fenced by project, but will allow unsuccessful exploration expenses to be deducted as a cost of successful projects.
- RRT proceeds would be shared between the central government and regional governments (departments) and municipalities where new mining projects are located.

3. COLOMBIA'S STATUTORY MINING FISCAL REGIME: A CROSS-BORDER OVERVIEW

As in most South American countries, the general tax regime for the business sector in Colombia consists of three main components: a corporate income tax, additional direct taxes that are not linked to profit but are based on a form of either business revenue or asset value, and indirect taxes that are directly imposed on the purchase price of capital goods.²⁰ For the mining industry, a normal additional levy is a mining royalty, which in Colombia is based on revenue and differentiated by mining product. In some cases, higher-than-statutory royalties have been negotiated in concession contracts for large mines.²¹

Unlike some major South American countries such as Argentina and Brazil, which have hardly changed their tax structures over the past decade, Colombia undertook several major tax reforms in recent years, the last two being implemented in 2007 and 2013, and it is presently discussing a new one. These two tax reforms involved only general business taxation for all industries, such as changes in the corporate income tax rate and base, and rollover and adjustments in the equity tax, which was to be a purely temporary tax.²² No reform has been introduced to the fiscal regime targeting only the mining industry, though a constitutional reform altered in a significant way the distribution of royalties, as discussed above. In comparison, Chile and Peru reformed their mining royalty systems from being a revenue-based royalty structure to a profit-based mining tax regime, although their reforms did not match up with the more desirable RRT-cum-royalty structure that we outlined in the last section.

In this section, we provide a comparative overview of the statutory mining fiscal regimes of Colombia and its four South American peers: Argentina, Brazil, Chile and Peru. Colombia is the top coal-mining country in the continent. It also produces substantial amounts of nickel, gold and other base metals such as iron ore. In comparison, Argentina, Brazil, Chile and Peru are richer in various metallic mining products including both precious and base metals. Since Colombia's mining royalty is differentiated by mining product, we cover all four of its major mining products (i.e., coal, nickel, gold and other base metals) in our comparative review. Table 1 summarizes tax and royalty provisions that are most relevant to these mining products.

²⁰ To keep cross-border consistency, we exclude from our METR calculation indirect taxes such as import duties on machinery and equipment, which are beyond the focus of our study.

²¹ This is the case for the two largest coal mines in the country.

²² Introduced in 2002 to finance a presumed temporary increase in military expenditures to confront the serious, growing guerrilla and paramilitary public-security menace.

TABLE 1 CORPORATE INCOME TAX AND MINING ROYALTY AND RENT TAX BY COUNTRY (2014)

	Colombia	Argentina	Brazil	Chile	Peru
Corporate income tax	34%	35%	34%, including a basic CIT (15%), a surcharge (10%) and a social contribution on net profit (9%).	21%, with two notes: (1) an effective 35% tax on after-CIT distribution; and (2) an inflation adjustment.	30%, with withholding tax on payments to non-residents: 1) interest: 4.99%. 2) dividends: 4.1%. 3) capital gains: 5%.
Exploration expenditures	Written-off within at least five years, but allows expensing of failed explorations.	Double deductions after production starts.	Amortized within the useful life of the mine.	Expensed.	Amortized within the useful life of the mine.
Development expenditures	Written-off in at least five years.	Accelerated depreciation in three years: 60%, 20% and 20%.	Amortized within the useful life of the mine.	Depreciated like fixed assets (see below).	Amortized within the useful life of the mine.
Depreciation: [yrs: number of years as official useful life; SL: straight line; DB: declining balance]	Buildings: 20 yrs; M&E: 10 yrs, with additional 25% allowance for every eight-hour shift; Automobiles & computers: Five yrs; Both SL and DB are allowed.	Buildings: 2% SL in general; accelerated depreciation within three years available for mining construction: 60%, 20% and 20%; M&E: 33% SL.	Buildings: 4% SL; M&E: 10% SL, but the normal rate can be increased by 50% for two-shift operations and doubled up for three-shift operations.	Buildings: 2% SL; M&E: 11.11% SL, which can be tripled for new or imported M&E; Automobiles: 14.29% SL.	Buildings: 5% SL; M&E: up to 20% SL (incl. vehicles) but no more than that recorded by financial accounting.
Inventory accounting (FIFO = first-in-first-out, and LIFO = last-in-first-out)	All conventional methods including FIFO and LIFO are permitted.	Virtually FIFO as the required official procedures result in year-end stock value nearly equal to its market value.	Only FIFO and average-cost accounting are allowed.	With inflation adjustment, FIFO and weighted-average-cost accounting are allowed.	All conventional methods are allowed.
Royalty	Royalty base: revenue at mine pit. Royalty rate varies by product: Coal (two tiers): Up to 3MT: 5%, More than 3MT: 10%; Nickel: 12%; Gold: 4%; Iron/copper: 5%; Deductible for CIT.	Royalty base: "mine-head value" that equals the sales value net of direct cost of exploitation (i.e., excluding depreciation of fixed assets). The royalty rate is 3% for coal, gold, copper and iron ore. However, an export tax of 5% (see below) effectively raised the royalty rate to 8%.	Royalty base: sales revenue net of taxes, insurance and freight costs. Royalty rate varies by product: Coal: 2%; Gold: 1%; Copper: 2%; Iron ore: 2%; Deductible for CIT.	Royalty base: the CIT base with certain adjustments; Royalty rate: 0.5%-14%, progressive by sales volume, with the first 12,000 metric tonnes exempted.	Three categories, all based on "operating profit": (1) Mining royalty payable by all: 1%-12% (minimum 1% of revenue); (2) Special mining tax by metallic miners: 2%-8.4%; (3) additional special mining contribution by metallic miners with "tax-stability agreement": 4%-13.2%.
Royalty: <i>Rent-based</i>	N/A	N/A	N/A	N/A	N/A

Other taxes (excluding property taxes)	Industrial and commercial tax (but the mining industry is exempted from this tax); and a “temporary” progressive equity tax, with an effective 1.5% annual rate on companies and individuals with net worth surpassing 5 billion pesos (\$2.5 million) (article 296.1 Tax Code).	A 5% export tax, and a local levy on gross receipts with the tax rate varying by industry and by province; the general tax rate is 1% for primary activities including mining.	N/A	A stamp duty on debt financing: 0.6%; and an equity-based municipal license fee: 0.25%–0.5%, payable annually (but capped at 8,000 UTM).	N/A
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References:

1. For Colombia, various official tax documents.
2. For other country-specific corporate income taxation, see Ernst & Young, *2014 Worldwide Corporate Tax Guide* (online), PFK, *Chile Tax Guide 2013* (online), and PWC “Chile enacts substantial tax reform,” October 3, 2014 (online).
3. For other country-specific mining taxation, see Price Waterhouse Coopers, “Corporate Income Taxes, Mining Royalties and Other Mining Taxes – A Summary of Rates and Rules in Selected Countries,” June 2012 (online) and John Gravelle, “Mining Taxation: Overview of Recent Trends,” September 2012 (online).

As shown in Table 1, Argentina has the highest corporate income tax rate (35 per cent) and Chile the lowest (21 per cent). Between these two extremes, Colombia and Brazil share the second-highest CIT rate (34 per cent), followed by Peru (30 per cent). However, while Colombia’s corporate income tax is final to financial investors, Chile further taxes after-CIT dividends leading to an effective final tax rate of 35 per cent on profit distribution. Similarly, Peru taxes all three types of after-CIT investment income (interest, capital gains and dividends) at various rates of up to five per cent, which makes for an effective final tax rate of close to 35 per cent on financial investors.

More importantly, the generosity of a given corporate income tax regime is determined by both the statutory tax rate and the associated tax allowances—including allowances for exploration, development and depreciable capital expenditures, as well as inventory-accounting regulations. In particular, a main feature of a corporate income tax regime applied to the mining industry is how it treats exploration expenditures, since such upfront expenditures can be substantial and may generate externalities that benefit the whole mining industry and even the overall economy.²³ For example, with the highest corporate income tax rate among all of these countries, Argentina also provides one of the most generous tax allowances for mining: it provides a double deduction for exploration expenses, an accelerated three-year allowance for mining construction and a 33 per cent annual allowance for mining machinery and equipment. Therefore, Argentina appears to have a typical high-rate/narrow-base income tax structure for its mining industry.

In comparison, Colombia allows writing-off successful exploration expenditures and development expenditures within at least five years, but expensing of the unsuccessful exploration costs; it provides depreciation allowances within a simple classification of depreciation assets by useful lives (i.e., 20 years for buildings, 10 years for machinery and equipment and five years for motor vehicles and computers) with an additional 25 per cent allowance for machinery and equipment for every additional eight-hour-shift operation. Chile allows full expensing of exploration expenditures and provides an accelerated allowance for machinery and equipment if they are new or imported; this accelerated allowance is equivalent to three times the normal rate based on the officially prescribed useful life. Both Brazil and Peru require exploration and development expenditures to be amortized over the useful life of the mine. As for depreciable assets, Brazil provides an accelerated depreciation allowance for M&E according to the number of operational shifts (e.g., double the normal allowance for a three-shift operation), a practice

²³ For an in-depth discussion, refer to Mintz and Chen, “Capturing Economic.”

similar to, but more generous than that in Colombia. In contrast, Peru sets the maximum depreciation allowance based on taxpayers' financial accounting, which helps minimize tax-induced misallocation of investment in depreciable assets.

With respect to the royalty system, the five countries can be divided into two groups: one with a conventional revenue-based royalty system and the other a profit-based mining tax. The first group includes Argentina, Brazil and Colombia, and these countries have very different royalty structures. In Colombia, the royalty rate varies widely by product: five per cent for coal with production under three million tonnes and 10 per cent otherwise (though concession contracts for the largest mines go up to 12 per cent); 12 per cent for nickel; four per cent for gold (and silver); and five per cent for other base metals including copper and iron ore. In contrast, Argentina has a standard royalty rate of three per cent, but it also collects a five per cent export tax on mining products, which effectively raises its revenue-based mining royalty to eight per cent. In contrast to these two cases of heavy royalties, Brazil's mining royalty is two per cent for most mining products and one per cent for gold.

Chile and Peru belong to the second group that features a mining tax based on operational income. The operational income or profit under their mining taxes is similar to the corporate income tax base but with certain adjustments; and the tax rate is structured progressively in both countries. In Chile, the mining tax regime exempts 12,000 metric tonnes of fine copper with a marginal tax rate ranging from 0.5 to 4.5 per cent for sales between 12,000 and 50,000 metric tonnes and from five to 14 per cent for sales over 50,000 tonnes. In Peru, the mining tax system consists of three parts: a general mining royalty applicable to all mineral products ranging from one to 12 per cent, a special mining tax ranging from two to 8.4 per cent applicable to all metallic mining products, and an additional mining contribution ranging from four to 13.12 per cent payable only by those companies that have a tax-stability agreement with the government. As a result, the combined mining tax rate in Peru is up to 12 per cent for coal and up to 33.52 per cent for those metallic miners that have a tax-stability agreement in force.

The contrast between the conventional revenue-based royalty system and the other profit-based mining taxes is self-evident. The conventional revenue-based royalty system is insensitive to mining profit because the royalty base includes the cost of mining. For a given royalty rate, the lower the profit margin, which is often associated with a lower commodity price, the higher the effective royalty rate based on profit. Therefore, a revenue-based royalty is commonly acknowledged to be regressive. Such regressiveness is bound to be more serious when the royalty rate is generally high (e.g., the aggregated eight per cent rate in Argentina), or when a higher royalty rate is imposed on a commodity with a lower profit margin (e.g., the 10 per cent-or-higher royalty rate applied to the large coal miners in Colombia). On the other hand, as discussed earlier, we are not convinced that the fine-tuned progressiveness in the profit-sensitive mining taxes in Chile and Peru is fully justified, at least, with respect to administrative efficiency.

As for other taxes based on either assets or gross revenue, Colombia imposes the highest tax burden through its equity tax based on a company's net worth. This equity tax was introduced in 2002 as a supposedly temporary measure to finance counterinsurgent military strategies. It was originally levied on equities surpassing 3 billion pesos with a flat tariff of 1.2 per cent. In 2011, however, it was extended to equities above 1 billion pesos, with a progressive tax rate up to an annualized rate of 1.2 per cent for net equity exceeding 5 billion pesos; and a 25 per cent surtax was introduced to net equity exceeding 3 billion pesos. Currently, fiscal authorities are posing a second rollover for another four-year period, 2015–2019. It is also noteworthy that this equity tax is not deductible for CIT purposes, which is unusual in other countries collecting this type of asset-based tax. The other two countries that impose such taxes in general are Argentina and Chile. Argentina collects a one per cent gross-receipts tax and Chile a 0.6 per cent tax on the part of assets financed by debt, both of which are deductible for CIT purposes.

In summary, among the five South American major mining countries, Colombia appears to have a rather high royalty rate by product, a middle level of corporate income tax and the highest asset-based tax. We will further assess Colombia's tax efficiency, competitiveness and revenue performance in the next section.

4. COLOMBIA'S MINING FISCAL REGIME: AN ASSESSMENT OF EFFICIENCY, COMPETITIVENESS AND REVENUE PERFORMANCE

To evaluate the impact of Colombia's tax/royalty regime on the mining industry in terms of its efficiency and competitiveness, we apply marginal effective tax- and royalty-rate analysis. The marginal effective tax rate (METR) is a well-established analytical tool for measuring the tax impact on capital investment.²⁴ The METR is calculated as the tax portion of the cost of capital, which includes both tax and non-tax costs. While the non-tax cost includes mainly financing cost (and replacement cost in the case of depreciable assets), the tax cost consists of all taxes payable net of tax allowances and credits. Therefore, the METR is often said to be a tax wedge between the gross-of-tax rate of return to capital and the net-of-tax rate of return to capital. And this tax wedge provides a gauge for assessing a given tax system with respect to its efficiency: A tax system is said to be efficient or neutral when the METR is identical across all types of capital assets and all industries; under such an efficient or neutral tax system, there would be no tax-induced investment to favour a specific type of asset or a specific industry. Also, if a country has a much higher METR than others with whom it competes in attracting investments, it will be at a competitive disadvantage with respect to the allocation of marginal flows of investment.

Unlike other analytical tools that also measure the "tax wedge" without an underpinning in economics,²⁵ the METR analysis is constructed on the basic theoretical assumption of profit maximization by firms. The assumption that firms are profit maximizers provides a starting point for calculating METR, which occurs when marginal revenue equals marginal cost. Since it is only the marginal cost that is observable, rather than marginal revenue, METR is evaluated as the effective tax cost as a share of marginal cost (net of economic depreciation), which is also the pre-tax rate of return on capital. For example, if the pre-tax rate of return on capital (i.e., the tax-inclusive cost of capital) is 20 per cent at the profit-maximizing point, and the post-tax rate of return on capital (i.e., the tax-exclusive cost of capital) is 10 per cent, then the METR is 50 per cent. Thus, the effective tax rate on income of the last dollar invested (that is, at the profit-maximizing point) would be 50 per cent.

²⁴ For the classic introduction to the METR concept and methodology, see R. Boadway, N. Bruce and J. M. Mintz, "Taxation, Inflation, and the Effective Marginal Tax Rate in Canada," *Canadian Journal of Economics* 17, 1 (1984): 62-79; and M. A. King and D. Fullerton, *The Taxation of Income from Capital: A Comparative Study of U.S., U.K., Sweden and West Germany* (Chicago: University of Chicago Press, 1984).

²⁵ Two such analytical tools that are popular for assessing tax impact are the average effective tax rate (AETR) and the project-based calculation of tax cost. Calculating AETR is based on taxes *paid* as a proportion of pre-tax profits, which are subject to economic and financial performance over a given time period. Therefore, it is not a reliable indicator for future policy design. The limitation of project-based calculation of tax impact on capital investment, although a forward-looking measure, lies in its requirement for discrete assumptions on investment size, internal rate of return, and the length of mine life; it is therefore suitable only for a single firm decision rather than providing general guidance to policy design.

By including the mining royalty as a part of the tax cost (or more accurately fiscal cost) to investors, the marginal effective tax rate becomes the marginal effective tax and royalty rate (METRR). However, the slight change in name does not alter the classic concept of METR discussed above. We use METRR and METR interchangeably in this paper depending on whether the mining royalty is involved or not.

Our METRR analysis focuses on the legislated fiscal regimes and ignores individual fiscal agreements between mining investors and the government, such as those in force for the two largest coal mines in Colombia, which by contractual agreement pay higher than statutory royalties. We cover nine industries for Colombia including mining, and eight non-resource industries: public utilities, construction, manufacturing, wholesale trade, retail trade, transportation and storage, communications, and other services. In our cross-border METRR comparison, we focus on the mining industry.

Also note that our METRR calculations and analysis cover only the large corporations. This is mainly because mining operations normally require substantial upfront capital investment that is affordable only for large corporations. Moreover, Colombia does not provide a distinctive corporate income tax regime for small business except for an initial two-year tax holiday and a subsequent three-year tax reduction (25 per cent). Such rate schemes are inefficient and even ineffective since startup firms are often not profitable in initial years and hence do not have to pay income tax regardless of whether there is a tax holiday or tax reduction.²⁶

Tax Efficiency within Colombia

By tax efficiency within Colombia, we mean tax neutrality among investment expenditures across different types of assets and different industries. This tax neutrality may be translated into a similar level of METR across different types of assets and industries. For example, if all investment projects across different industries incur a similar tax cost at the margin, as measured by METR, then we judge the overall tax system to be reasonably neutral or efficient. In other words, dispersion in METR across different types of assets and different industries indicates tax inefficiency; and the wider the METR dispersion, the less efficient the overall tax system. In the meantime, by estimating the METR associated with each fiscal levy, or itemized METR, one can attribute the tax distortion to individual fiscal levies so as to pinpoint specific tax issues and potential fixes.

Table 2 presents the aggregated and itemized METRR impact of individual tax and royalty attributes. The METRR for mining is the simple average of the METRRs across all the mining products, including coal from both large and small mines, nickel, gold and other base metals. More detailed METRR by mining product for Colombia is presented in Table 3. We also assume that mining, manufacturing and processing firms operate in three shifts, implying they can claim a tax-depreciation allowance at 1.5 times the regular official rate (Table 1).

²⁶ For more in-depth discussion of this issue, refer to Jack Mintz, "Corporate Tax Holidays and Investment," *The World Bank Economic Review* 4, 1 (January 1990): 81-102, www.jstor.org/stable/3990028.

TABLE 2 MARGINAL EFFECTIVE TAX RATE ON CAPITAL INVESTMENT IN COLOMBIA: 2014

	Mining**	Public Utilities	Constr.	Manuf.	W. Trade	R. Trade	Transp.	Comm.	Other Services	Weighted Average
Base Case 2014*	32.9	16.8	19.1	20.2	18.4	19.4	18.7	30.0	21.8	21.1
If only one of the following taxes applies:										
Mining Royalty	21.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6
Income Tax	12.6	15.4	16.8	17.7	16.5	17.7	16.7	27.3	19.3	18.6
Municipal I&C Tax	0.0/2.4***	1.9	3.1	3.4	2.6	2.3	2.8	4.8	3.6	3.3
Reference: impact of the equity tax										
<i>Aggregated METR</i>	44.6	31.5	33.4	35.4	32.2	33.2	34.5	43.3	36.6	36.1
<i>If only the equity tax applies</i>	11.5	15.2	15.7	16.7	14.9	15.2	16.7	18.2	16.8	16.3

* Excluding the supposedly “temporary” equity tax, of which the METR impact is presented in the bottom panel of this table.

** The numbers for mining involving mining royalties are a simple average across all mining products including coal from both large and small mines, gold, nickel and other base metals; otherwise, the METR for mining is identical across all mining products.

*** The non-zero number indicates the possible METR impact of the municipal industrial and commercial taxes should miners not be exempt from this tax.

As Table 2 shows, among all the government levies and for all the industries but mining, corporate income tax is the main contributor to the METR, equity tax is a close secondary contributor and municipal industrial and commercial tax a distant third. For the mining industry, the mining royalty is the main contributor to the METRR, followed by CIT and the equity tax.

Mining royalty. Compared with the highest METR for non-resource industries, which is 30 per cent for communications, the average METRR for mining (32.9 per cent) is almost three percentage points higher. When considering only the mining royalty, the METRR is 21 per cent. More importantly, as shown in Table 3, behind this simple average METRR associated with mining royalties, there is a very wide METRR variation across the major mining products from 5.7 per cent for gold to 36.5 per cent for larger coal miners.

TABLE 3 METRR (IN PER CENT) BY MINING PRODUCT

	Coal*	Nickel	Gold	Other Base Metals	Simple Average
Aggregate	30.9/49.1	38.9	18.3	27.2	32.9
Royalty only	18.3/36.5	26.3	5.7	14.6	21.1
<i>Reference:</i>					
• <i>The statutory royalty rate by product</i>	5%/10%	12%	4%	5%	
• <i>The profit margin by product</i>	12%	20%	31%	15%	
• <i>Equivalent profit-based royalty rate</i>	42%/83%	60%	13%	33%	

This wide METRR variation among mining products is solely caused by the existing royalty system. That is, the royalty is not only revenue-based and hence insensitive to profitability, but also provides a rate differentiation by product with little justification. As presented in Table 1, the statutory royalty rate ranges from four per cent for gold to 12 per cent for nickel. By taking into account our estimate of profit margin by product, which ranges from 12 per cent for coal to 31 per cent for gold, the equivalent profit-based royalty rate ranges from only 13 per cent for gold to over 80 per cent for coal. Therefore, the large coal miners bear the highest METRR of 49 per cent while gold miners only bear an METR of 18 per cent.

Corporate income tax. By looking at the simulation that singles out only the corporate income tax, the METR for the mining industry (12.6 per cent) is well below the average across all industries (18.3 per cent), and that for the communications industry (27.3) is well above the average.

To better understand such wide cross-industry METR dispersion, Table 4 provides the METR breakdown by asset type and by industry. As the table shows, depreciable assets are, on average, the highest taxed among the five major types of capital, followed by land and inventory (9.7 per cent for both), mine development (5.3 per cent) and exploration (-2.3 per cent).

**TABLE 4 METR ON CAPITAL INVESTMENT IN COLOMBIA
INCLUDING ONLY CORPORATE INCOME TAX, BY INDUSTRY AND ASSET TYPE (2014)**

	Mining	Public utilities	Constr.	Manuf.	W. Trade	R. Trade	Transp.	Comm.	Other Services	Weighted Average
Depreciable assets	26.9	18.3	22.4	20.7	23.9	24.2	17.8	28.2	21.5	21.8
Land	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7
Inventory	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7
Non-E&D aggregate	22.5	15.4	16.8	17.7	16.5	17.7	16.7	27.3	19.3	18.6
Exploration	-2.3									
Development	5.3									
Aggregate	12.6	15.4	16.8	17.7	16.5	17.7	16.7	27.3	19.3	18.6

There are two main factors behind this METR dispersion among different types of assets. One is the tax allowance that deviates from the actual cost of capital, including financing cost and economic depreciation rate, and the other is the inflation rate, which can exacerbate tax distortions. For example, for capital invested in land and inventory, the only non-tax cost is the real financing cost, and the tax deduction for the nominal interest rate helps reduce this financing cost. Therefore, the higher the inflation rate, the lower the real financing cost, and hence the lower the METR for land and inventory.

As for depreciable assets with varying useful lives, the METR for a given class of depreciable assets can be high (low) because their official useful life is longer (shorter) than their actual useful life and hence their tax depreciation allowances mismatch the actual economic depreciation rates to greatly varying degrees. Such mismatch of useful lives is more possible in Colombia since all the depreciable assets are roughly classified into only three groups while the reality is more diverse. For example, machinery and equipment used by the communications industry requires rapid advancement of technology and hence may have a much higher economic depreciation rate compared to the tax depreciation allowance determined by their 10-year official life. In contrast, gas pipelines used by the public utilities industry may last more than 10 years and hence may enjoy a more generous tax depreciation allowance than their economic depreciation rate requires. As shown in Table 4, the METR for depreciable assets used by communications is the highest among industries, while that for public utilities is the second lowest. In the meantime, any positive inflation rate can reduce the present value of the tax depreciation allowance and hence increase the METR for all depreciable assets as a whole.

The METRs for exploration and development assets—minus 2.3 per cent and 5.3 per cent respectively—are the lowest among all the five types of assets. This is because both exploration and development expenditures can be written-off within five years, which is much shorter than the period over which they

are depleted, given that the minimum average life of a productive mine is around 10 years.²⁷ Note that a negative METR does not mean a cash handout to the investor but a tax loss at the margin that, in reality, can be used to offset tax liability arising from intra-marginal investment projects or carried over to offset future tax liabilities.

With this insight into inter-asset tax variation, it becomes straightforward to see why the mining industry is the lowest taxed under the corporate income tax system, as measured by the METR of 12.6 per cent: it is because over 40 per cent of mining capital is invested in exploration and development, which are the lowest-taxed assets among all.

Among non-mining industries, communications is the highest taxed, with an METR over 27 per cent. This is mainly because over 90 per cent of the capital assets used by the communications industry are depreciable assets (of which 90 per cent are machinery and equipment), which are the highest taxed assets among all.

For all the other industries, the rule of thumb is that, the higher the share of capital used by an industry in a type (or types) of asset that incurs a higher METR, the higher the overall METR is for that industry.

The municipal industrial and commercial tax. The municipal industrial and commercial tax (MICT) is levied on gross revenue and hence is modelled like a gross-receipts tax. It is a direct reduction in business revenues, which is akin to increasing the cost of capital at the margin (where marginal revenue equals marginal cost). Therefore, the higher the cost of capital without MICT, the higher the cost of capital with MICT and hence the greater the METR impact of MICT will be, and vice versa. Since the cost of capital is greater for depreciable assets (buildings and machinery) than that for non-depreciable assets (land and inventory), industries that use depreciable assets more intensively are affected more significantly by the MICT, and vice versa. Therefore, when considering only the municipal industrial and commercial tax (Table 2), from which the mining industry is exempted, the communication industry appears to be the most heavily taxed because its capital is more heavily allocated to depreciable assets than non-depreciable ones (94 per cent: six per cent), followed by “other services” (79:21) and manufacturing (70:30). At the other end of the spectrum, wholesale trade and retail trade appear to be less heavily taxed because around 50 per cent of their capital is allocated to non-depreciable assets such as inventory and land.

The equity tax. By including the equity tax, which is supposed to be temporary in spite of several reinstalments, the weighted average of the overall METRRs across industries increases by almost 15 percentage points, from 21.6 to 36.1 per cent. There are mainly two reasons for such a significant METR impact arising from the equity tax. First, the 1.5 per cent tax rate (including the 25 per cent surtax) is excessively high. And second, this tax is neither deductible for, nor creditable against, the income tax.

²⁷ Note that allowing exploration expenditures to be fully written-off as they occur, regardless of their success, is not an unusual practice. The argument for fully expensing exploration expenditures is because they are “akin to research, to the extent that such activities are essentially about information and knowledge acquisition. There are typically thought to be spillovers associated with the generation of information and knowledge. These spillovers mean that the information discovered or acquired by one firm generates information, and therefore uncompensated benefits, to others. Without government grants or tax preferences, (return from) information and knowledge acquisition would be too low, since businesses do not fully appropriate social returns on their investments. This provides a policy rationale for subsidizing knowledge acquisition, which becomes a typical justification for the R&D tax credit that is available to all corporations. A similar point may be made with regard to exploration (but perhaps not development) in the resource sector.” That is, the discovery (or not) of certain natural resources in a particular region most certainly makes information public to the government and to other investors, who incur no cost for acquiring such information (Refer to Mintz and Chen, “Capturing Economic,” 7).

To our knowledge, very few countries around the world still levy such a capital-based tax on an annual basis, with either a much lower rate or a much narrower tax base.²⁸ And this kind of tax as levied in other countries is always deductible for income tax purposes.

It is noteworthy that the equity tax appears to have a less significant impact on mining (11.5 percentage points) than on non-mining investment (ranging from 15 to 18 percentage points). This is mainly because a large share (over 40 per cent) of mining investment is allocated to exploration and development that can be written-off within five years, which is much faster than the allowance for depreciable assets used by most non-mining industries. This implies that a much smaller portion of mining capital can be counted as taxable equity compared to that in non-mining industries. Therefore, the METR impact of the equity tax is less significant on mining than on other industries.

In summary, the main observations concerning Colombia's tax efficiency based on our METRR analysis are the following:

First, the revenue-based mining royalty appears to be rather high. This is particularly true for the coal mines, for which the rather low profit margin of 12 per cent equalized the general 10 per cent royalty rate based on revenue to an over-80 per cent royalty based on profit. Not to mention the royalty for the largest coal miners is contractually set at 12 per cent.²⁹ As the owner of natural resources, the government is entitled to collect royalties from mining activities in addition to collecting general income taxes. This rationale, however, does not prevent policy-makers from searching for optimal approaches including an optimal royalty rate for long-term rent maximization, which is in the interest of both the mining industry and the public good.

Second, the corporate income tax system can be improved by lowering the tax rate and better matching the tax depreciation allowance with the economic depreciation rate for depreciable assets. The former would encourage more capital investment in the country and the latter could significantly alleviate the existing inter-asset and inter-industry tax distortions.

And finally, the other non-profit-based taxes, such as the revenue-based municipal industrial and commercial tax and the net equity tax, can discourage capital investment in general, particularly investments on machinery and equipment that bear higher costs of capital than non-depreciable assets such as inventory and land. Therefore, any action taken by policy-makers to alleviate such profit-insensitive levies will encourage capital investment in Colombia.

The Cross-Country METRR Comparison for Mining

In the globalized free-market system that allows capital to cross borders freely, business taxation is one of the main factors that affect capital allocation among jurisdictions that share a similar non-tax environment, including political stability, institutional settings, labour quality, infrastructure and natural resources. Within this context, the METRR analysis can provide a gauge for assessing the relative tax competitiveness that influences capital investment across borders.

Table 5 presents the METRR by mining product across countries. We focus on the impact of corporate income tax and mining royalties and ignore any other revenue- or asset-based taxes.³⁰ We also assume all

²⁸ Examples known to us include Ecuador (0.15 per cent), Luxembourg (0.5 per cent), Pakistan (0.01 per cent) and Switzerland (ranging from 0.001 to 0.525 per cent); Russia and Uzbekistan levy a higher tax (2.2 per cent and 3.5 per cent respectively), but their tax bases are much narrower.

²⁹ However, in the METR calculations we used only the statutory rate of 10 per cent for large projects

³⁰ As shown in Table 2, the METR impact of the current 1.5 per cent equity tax on Colombia's mining investment is 11.5 per cent on average. Our simulation shows that the METR impact of Argentina's one per cent gross-receipts tax is about three percentage points and that of Chile's 0.6 per cent tax on debt financing less than one percentage point.

the miners run three shifts so that the tax consequence can be evaluated consistently across the border based on the statutory provisions (Table 1).

In Table 5, we provide three cases: (1) including only the corporate income tax (CIT), which is the same for all mining products; (2) including both CIT and the mining royalty; and (3) including only the mining royalty. The latter two cases are modelled for each of the four main mining products in Colombia: coal, nickel, gold and other base metals including iron ore and copper. Note that for Chile and Peru, the only two countries having a profit-based and progressive mining tax, we apply the highest mining tax rate applicable so as to compare Colombia's METRRs to their maximum counterparts in other countries. As a reference, we also include the other three top coal exporting countries—Australia, Russia and South Africa—in the table for their METRRs associating with coal mining.

TABLE 5 METR (IN PER CENT) ON CAPITAL INVESTMENT IN MINING, BY PRODUCT AND BY COUNTRY (2014)^A

	Colombia	Argentina	Brazil	Chile ^c	Peru ^d	Australia ^e	Russia ^f	South Africa ^g
CIT only	12.6	-20.7	10.1	5.4 (9.9)	14.9 (17.2)	11.4	5.6	14.8
Coal (PM = 12%)^b								
<i>Aggregate</i>	30.9/49.1	24.5	20.4	11.5 (16.0)	19.8 (22.2)	48.8	5.6	41.0
<i>Royalty only</i>	18.3/36.5	29.2	7.3	1.0-6.1	0.4-5.3	36.5	NA	25.6
Nickel (PM=20%)^b								
<i>Aggregate</i>	38.9	NA	17.7	NA	NA	NA	NA	NA
<i>Royalty only</i>	26.3	NA	4.4	NA	NA	NA	NA	NA
Gold (PM = 31%)^b								
<i>Aggregate</i>	18.3	-1.8	14.9	11.5 (16.0)	28.7 (31.0)	NA	NA	NA
<i>Royalty only</i>	5.7	11.4	1.4	1.0-6.1	3.1-14.7	NA	NA	NA
Other base metal (PM = 15%)^b								
<i>Aggregate</i>	27.2	16.7	19.0	11.5 (16.0)	28.7 (31.0)	NA	NA	NA
<i>Royalty only</i>	14.6	23.4	5.8	1.0-6.1	3.1-14.7	NA	NA	NA

^a Refer to Table 1 for statutory provisions concerning income tax and mining levies.

^b PM stands for “profit margin,” which is relevant only to the revenue-based royalty regimes in Colombia, Argentina and Brazil.

^c For Chile, the aggregated METRR includes the highest mining tax rate of 14 per cent while the METRR associated with “royalty only” covers the range of royalty rates from low to high. Also note that the higher number in brackets for “CIT only” or “aggregate” cases includes the withholding tax on after-CIT distribution to financial investors.

^d For Peru, the aggregated METRR includes the highest mining tax rate by product: 12 per cent for coal and 33.2 per cent for gold and base metals; and the METRR associated with “royalty only” covers the range of royalty rates from low to high. Also note that the higher number in brackets for “CIT only” or “aggregate” cases includes the withholding tax on after-CIT distribution to financial investors.

^e For Australia, we apply a 29 per cent CIT rate and an average of a 10 per cent state royalty rate.

The following observations may be drawn from Table 5:

First, considering only corporate income taxes, Colombia's METRR (12.6) appears to be the second highest but also close to the middle point among its South American peer countries. Peru's highest METRR (14.9 per cent) is mainly due to its less generous tax allowance compared to all the other countries. As a sharp contrast, Argentina presents a negative METRR arising from its excessively generous tax allowance for all types of mining assets (refer to Table 1). Note that a negative METRR indicates a tax subsidy at the margin but does not mean a cash handout from the government. Instead, it implies a tax loss at the margin that can be utilized to offset the overall or future tax liability within the company.

Second, by taking into account the mining royalty and focusing on coal mining, Colombia has the highest METRR (36.5 per cent) associated with its 10 per cent royalty for production volume of over three million tonnes. This ranks Colombia similarly with Australia for its royalty burden on coal but higher than South Africa and its South American peers. It is fair to observe, however, that Australia and South Africa are direct competitors with Colombia in coal, while other South American countries are not, due to their considerably lower reserves and lower quality of coal. As mentioned above, given a rather low profit margin for coal (i.e., 12 per cent), a 10 per cent royalty rate based on revenue is equivalent to an over 80 per cent tax on profit.

Also note that Colombia's aggregated METRR for large coal miners (over 49 per cent) is considerably higher than that for South Africa and slightly higher than that for Australia. In comparison, the METRRs for coal miners in the other four South American countries are substantially lower. Argentina's METRR associated with mining royalty is the second highest in South America for coal mining because of its effective royalty rate of eight per cent, combining its three per cent mining royalty and five per cent export tax on mining products.

Third, as between the two major nickel-mining countries, Colombia's royalty burden as measured by METRR (26.3 per cent) is more than six times that of Brazil (4.4 per cent). This is not surprising given that Colombia's royalty is 12 per cent for nickel compared to the two per cent royalty in Brazil. As shown in Table 3, with a 20 per cent profit margin for nickel, the 12 per cent revenue-based royalty is equivalent to a 60 per cent profit-based tax.

Fourth, for gold (and silver), Colombia's METRR associated with the royalty (i.e., 5.7 per cent) is either the second lowest in South America—if we consider only the highest mining tax rates in Chile and Peru—or the second highest, if we consider only the lowest mining tax rates in Chile and Peru. Brazil ranks the lowest because of its lower royalty rate (one per cent for gold) compared to that in Colombia (four per cent for gold). Peru appears to have the highest METRR (14.7 per cent) corresponding to its highest possible mining tax rate (33.52 per cent) applied only to the metal miners that have a tax-stability agreement in force. For other metal miners in Peru, the METRR could be as low as three per cent if the lowest combined mining tax rate of seven per cent is applied. Argentina's high METRR (11.4 per cent) is associated with its effective eight per cent royalty based on revenue (see above). Therefore, the METRR for gold mining in Colombia ranks roughly in the middle given the wide range of mining tax rates applied in Chile and Peru.

Fifth, for the base metals such as copper and iron ore, and if we consider only the mining levies, Argentina's METRR is the highest (23.4 per cent) due to its rather high tax rate (eight per cent) based on revenue, combining the mining royalty and mining export tax; Colombia's METRR (14.6 per cent) is very close to Peru's upper limit of its METRR range (3.1–14.7 per cent). This is because, when taking into account the estimated 15 per cent profit margin for the base metals in general, the five per cent revenue-based royalty in Colombia is equivalent to a 33.3 per cent profit-based mining tax, almost the same as that of the maximum mining tax rate (33.5 per cent) for base metals in Peru.

And finally, regardless of their METRR levels, Chile and Peru tie the government mining levies directly to mining profit. Through these entirely profit-sensitive levies, the governments share with the investors both the downturn risk and upturn windfalls and the investors therefore are able to make investment decisions with greater certainty in profit sharing while riding the market fluctuations. In contrast, Colombia, along with Argentina and Brazil, still relies solely on the conventional revenue-based royalty, which can cause wide variation in royalty cost across different mining products and severe tax regressivity along with commodity-market fluctuation, as shown below. Obviously, a revenue-based royalty is less efficient compared to a profit-based royalty, and it is even worse compared to a rent-based tax as shown in our further METR simulations in Section 5.

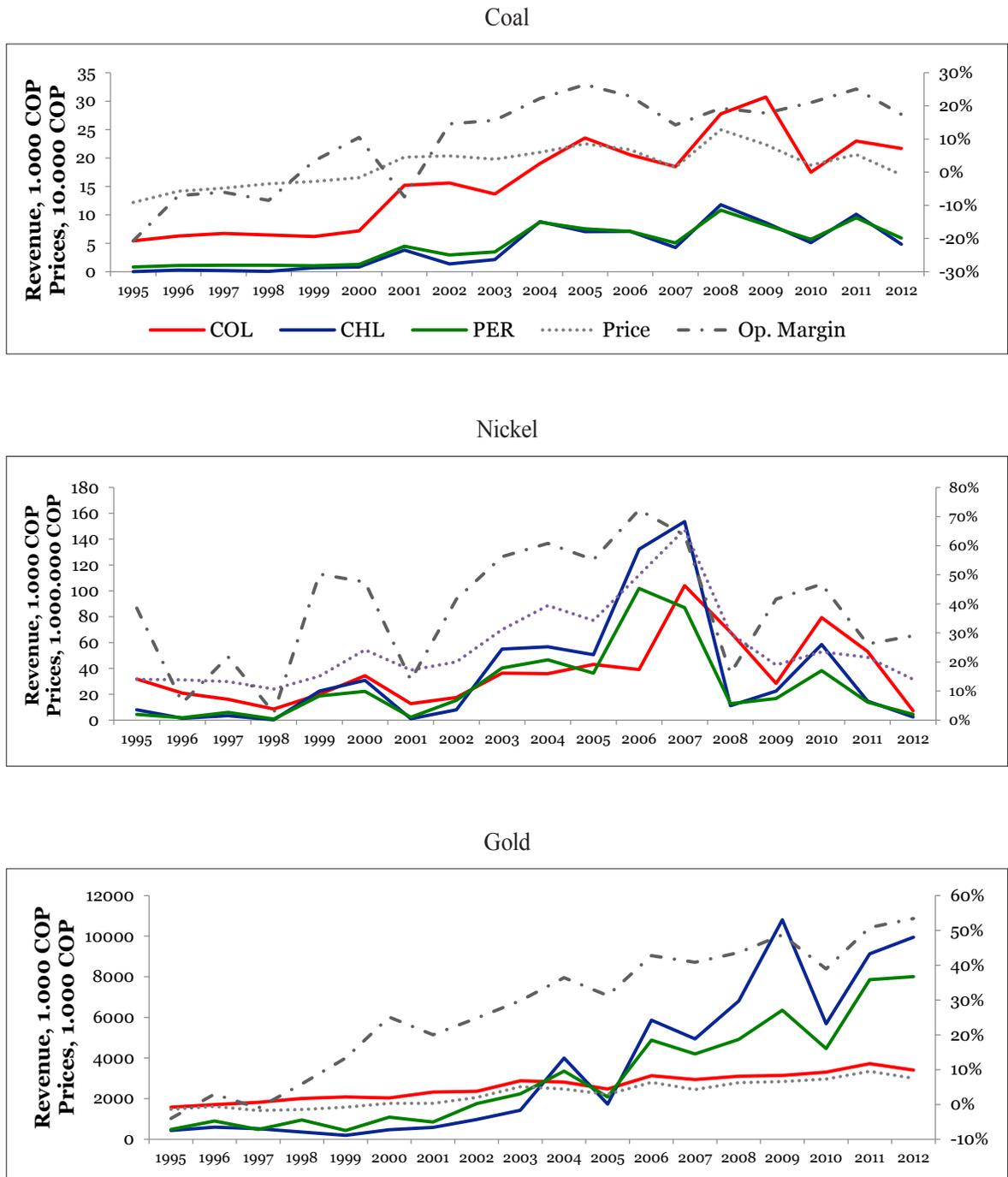
Revenue Performance: Comparing with the Peruvian and Chilean Royalty Systems

We showed in Section 2 that a complementary criterion for assessing a mining fiscal system is its capacity to bring substantial revenues for the government from highly profitable projects (those with higher intra-marginal rents) and in periods of high prices, when most mining projects obtain exceptional profits, while avoiding overtaxing marginally profitable mines or most mining activities in periods of low prices. As mentioned, conventional gross-revenue-based royalties, such as those in force in Colombia, fare especially bad in this regard. We illustrate here this point by comparing the revenue performance of the Colombian royalty regime during the 1994–2012 period (for which we have detailed financial data for the largest Colombian mining companies) with what would have happened if the profit-sensitive current Peruvian and Chilean royalty regimes had been in force. Companies for which we were able to collect the required data for that period include: Cerromatoso, which accounts for all nickel production and exports in Colombia; the three largest coal companies (Cerrejón, Drummond and Prodeco), that account for 80 per cent of coal production and 93 per cent of coal exports; and Mineros de Colombia, which accounts for seven per cent of gold production. Thus, with the exception of gold, whose production is highly atomized in Colombia, our simulations cover all or most of the tax collections from the mining industry.

A caveat is in order before presenting our results. These simulations are purely illustrative, as they do not take into account how companies would have reacted to alternative tax regimes; e.g., they are not proper counterfactuals. As the efficiency costs of the Chilean and Peruvian alternatives examined are lower than for the present Colombian tax regime, investment, production and profits, might have been larger, and thus our estimated revenues for these alternative regimes should be considered a lower bound.

Figure 1 compares the actual royalties paid by ton or ounce troy produced by the largest Colombian coal, nickel and gold mines from 1995 to 2012, with what would have been paid if the Peruvian and Chilean regimes (for large production mines) had applied to them, under the assumption that production decisions would not have changed. This figure shows clearly that, as expected, the application of both the Chilean and Peruvian regime would have captured a significantly higher fraction of the windfall that took place between 2003 and 2012 in the case of gold, and between 2003 and 2007 in the case of nickel, while taxing the companies less in periods of lower prices, in the case of these two commodities. On the contrary, both regimes would have taxed the large coal companies less during the whole period.

FIGURE 1 COMPARING THE COLOMBIAN, CHILEAN AND PERUVIAN REGIMES. REVENUE PER TON



As a consequence, as shown in Table 6 the present value of tax revenues would have been significantly higher with the Peruvian and, especially, with the Chilean regimes in the case of gold; it would have been similar (when applying the Chilean regime) or lower (when applying the Peruvian regime) for nickel; and would have been significantly lower in the case of coal.

**TABLE 6 ROYALTY REVENUES (1995-2012) IN PRESENT VALUE*:
COLOMBIAN, CHILEAN AND PERUVIAN REGIMES**

Coal

	Colombia	Chile	Peru
Present value mining revenue	41,830,289,877	12,936,513,679	13,509,957,179
Percentage change in PV	0%	-69%	-68%
Progressivity w/ prices	0.2062	0.0961	0.0850
Progressivity w/margins	0.42	0.20	0.18

Nickel

	Colombia	Chile	Peru
Present value mining revenue	8,503,532,086	8,674,809,054	6,287,555,738
Percentage change in PV	0%	2%	-26%
Progressivity with price	0.5703148	1.2777748	0.8130981
Progressivity with profit margin	0.09	0.33	0.22

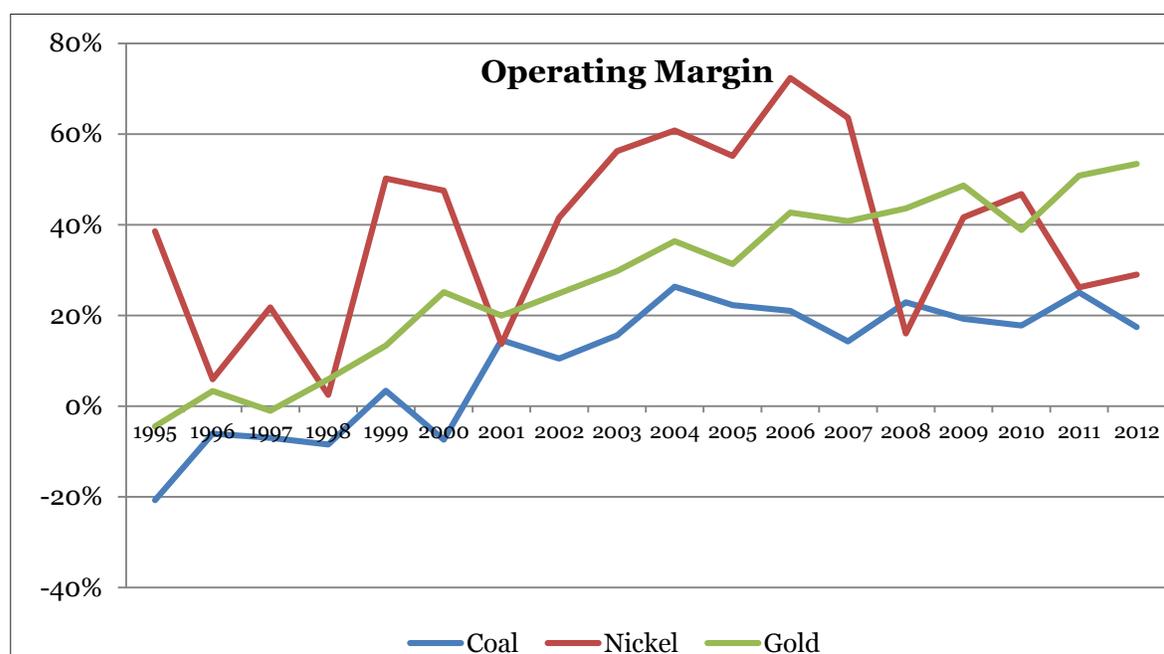
Gold

	Colombia	Chile	Peru
Present value mining revenue	352,778,739	706,470,883	568,044,717
Percentage change in PV	0%	100%	61%
Progressivity with price	0.0007	0.0040	0.0028
Progressivity with profit margin	0.03	0.19	0.14

* Figures are expressed in 2012 pesos and were carried forward using a real discount rate of six per cent.

The sharp differences observed by minerals are related to the fact that operational margins in coal are significantly lower than they are in gold and nickel (Figure 2), while royalties have been much higher for the two largest coal mines, and lower for gold.

FIGURE 2 OPERATIONAL MARGINS FOR LARGE NICKEL, GOLD AND COAL MINES IN COLOMBIA



In summary, these results indicate that, because of the fact that the Colombian royalty regime is insensitive to operational margins, it failed to capture a significant fraction of the high profits that took place in gold during 2003 to 2012 and in nickel during 2003 to 2007, while it probably overtaxed the companies in periods of low prices, especially in the case of the two largest coal projects.

Therefore, Colombia's sole reliance on a revenue-based royalty system needs to be reformed to be sensitive to both the investors' desire for profit maximization and the government's need for revenue. In the next section, we will propose some changes to Colombia's mining tax/royalty system to make it more efficient while generating higher revenue to the government from highly profitable projects and in periods of high prices.

5 ASSESSMENT OF REFORM OPTIONS

For economic efficiency, we propose a rent-based tax targeting only the rent generated from mining in new projects. However, as discussed in Section 2, we need to preserve a revenue-based royalty to ensure a minimum revenue flow for public finance from the start of production and in periods of low prices. But we also need to reduce this royalty to minimize its distortive impact among and within mining sectors and encourage capital investment in Colombia's mining industry as a whole. And finally, as discussed earlier, the revenue-based royalty may be made deductible for RRT purposes or creditable against RRT. Our preference is to make royalty creditable against the RRT so that the ultimate mining levy is solely based on the rent.

Further, as discussed in Section 2, the RRT can be established as a fully independent tax from the CIT, or else CIT payments can be made deductible from the RRT base. While the second option fares better in terms of efficiency and competitiveness, it does pose significant administrative problems and may be politically more difficult to apply given that it requires a higher RRT rate in order to generate similar levels of revenues (see below). We present efficiency (METRR) estimates and revenue simulations for both options, in order to facilitate decision-making by government and Congress.

The process carried out in formulating our RRT options combined the METRR and the revenue simulations in an iterative manner: For every possible RRT option, the METRR simulations are aimed at assessing efficiency implications while bearing in mind cross-border competitiveness, and the revenue simulations evaluated revenue impacts. Through this process, we ranked the multiple options by their efficiency, competitiveness and revenue consequences. Ideally, we would like to add a third tool, a computable general equilibrium (CGE) model that can further simulate possible dynamic reactions by the direct and indirect economic players to our proposed RRT options so as to help policy-makers better assess the overall economic outcome of these options. Unfortunately, building this additional modelling tool is beyond the scope of this paper.

It is also noteworthy that both our METRR and revenue simulations are not without some critical problems. For example, although the METRR analysis and simulations provide a good indicator for tax efficiency and competitiveness, our non-tax parameters are based on the past statistics available, which do not provide a perfect resemblance of the future to say the least. In particular, we estimated the mining profit margin by product based on past data. As pointed out repeatedly in this paper, for a given revenue-based royalty rate, the METRR can vary wildly among different products because the profit margin varies widely by product. Since the profit margins for all mining products are bound to change in unpredictable directions due to the unpredictability of the commodity market and variation in mining conditions, for a given product across different mines any METRR impact associated with a given royalty rate may deviate significantly from our current METRR estimates. Therefore, these estimates should be taken only as a proxy for the efficiency and competitiveness effects of alternative designs.

As for our revenue simulations, with no access to official aggregated revenue data by sectors, we had to use the best publicly available data from some major representative mining firms in Colombia. Unfortunately, these firm-based data sets cover only the period of 1995–2012, which includes a very high price period (2003–2012), but they do not cover the period of high initial investments. Therefore, our revenue simulations may result in overestimates of the possible revenue increase associated with various RRT options, even as they do not take into account positive reactions of investment and production decisions that would have been induced by a less distortionary fiscal regime.

Efficiency and Competitiveness Effects of Proposed Changes: The METRR Estimates

Our METRR simulations presented in Table 7 are aimed at illustrating how our proposed alternative mining fiscal systems can eliminate or alleviate present METRR dispersion among mining products (and reduce their present differences with those of other activities) while preserving or improving Colombia's mining tax competitiveness.

Furthermore, since the existing revenue-based royalty is the main distortionary factor, as shown in Table 5, it is clear that we need to eliminate the excessively high royalty rates such as the 10 per cent for large coal mines and the 12 per cent for nickel for future projects. Therefore, we set the five per cent royalty rate, which is currently applied to small coal mines and base metals other than nickel, as the baseline for our royalty rate. It would be desirable to reduce this five per cent royalty rate further if it were not for revenue concerns, as discussed below.

Table 7 presents our METRR simulations for the three major RRT options that appear to be the most desirable. These options are generated jointly with the revenue simulations, of which the outcomes are presented in Table 9. These three RRT options are:

- Option A: the revenue-based royalty is *deductible* from the RRT base, and there is no interaction between RRT and CIT despite some overlap between their tax bases.
- Option B: the revenue-based royalty is *creditable* against the RRT, and there is no interaction between RRT and CIT despite some overlap between their tax bases.
- Option C: the revenue-based royalty is *creditable* against the RRT and, to avoid possible overlapping, *the CIT payment is made deductible from the RRT base.*

TABLE 7 METRR SIMULATIONS FOR RRT OPTIONS

Option A: Royalty is deductible for RRT, and no interaction between RRT and CIT			
	RRT=20%	RRT=35%	RRT=40%
Coal	36.9	38.9	41.2
Nickel	29.7	31.7	34.0
Gold	25.9	27.9	30.3
Other base metal	33.3	35.3	37.6
Option B: Royalty is creditable against RRT, and no interaction between RRT and CIT			
	RRT=30%	RRT=35%	RRT=40%
Coal	23.3	26.1	29.4
Nickel	23.3	26.1	29.4
Gold	23.3	26.1	29.4
Other base metal	23.3	26.1	29.4
Option C: Royalty is creditable against RRT, and CIT is deductible for RRT purposes			
Coal		12.6	
Nickel		12.6	
Gold		12.6	
Other base metal		12.6	
Reference: Current system			
Coal (PM = 12%)		40.0	
Nickel (PM = 20%)		38.9	
Gold (PM = 31%)		18.3	
Other base metal (PM = 15%)		27.5	

Under Option A, when the revenue-based royalty is deductible from the RRT base, tax efficiency appears to be improved significantly compared to the current system, as measured by the substantially reduced METRR variation across mining products under a given RRT rate. However, for any combination of a given royalty rate and a given RRT rate, the METRR still varies by product in the opposite direction to which the profit margin varies. For example, the METRR associated with the 20 per cent RRT ranges from 25.9 per cent for gold, the most profitable product, to 36.9 per cent for coal, the least profitable product. This is the same story as that resulting from the current system but to a much lesser degree due to the introduction of RRT, for which the standardized and largely reduced royalty is deductible. Noticeably, the METRR can be significantly higher for more profitable mining products (e.g., gold) compared to that under the current system. Furthermore, the METRR increases with the RRT rate due to the partial overlap of the RRT and CIT bases.

In contrast, under Option B, when the revenue-based royalty is creditable against the RRT, and hence the RRT becomes the ultimate government levy specifically targeting the mining industry, the tax distortion across mining products under Option A (and the current system) disappears altogether. That is, all mining investment would bear the same tax cost under a given RRT rate across all mining products. However, the estimated METRR increases with the RRT rate due to the interaction between the RRT and CIT, as there is a partial overlap of the bases for these two taxes. As a consequence, if revenue goals dictate the need for a high RRT rate, competitiveness with other mining countries might be impaired. In other words, when the royalty is creditable against the RRT, the government decision in choosing a preferred RRT rate would be based on the trade-off between its current revenue needs and the desired competitiveness against countries that compete with it for mining investments, and, consequently, its long-term revenue prospects.

Finally, Option C preserves the advantage of Option B of eliminating distortions among mining activities, and in addition allows CIT to be deducted for RRT purposes. As a result, the METRR for Option C would be much lower at 12.6 per cent, the same as that when only the CIT is considered (Table 4). This implies that when CIT is deductible for RRT purposes, there is no overlap of tax bases for CIT and RRT. Therefore, the METRR for Option C is solely determined by the CIT because the effective tax rate associated with a pure RRT (i.e., a tax based on pure rent) is zero at margin since there is no rent at margin. Thus, Option C can be seen as the most efficient option, with which the trade-off between competitiveness and revenue that characterizes Option A would disappear. However, as discussed in Section 2, this option is administratively more demanding and, as shown below, would require a higher RRT rate for a similar revenue goal, which would further put strains on the administration and can make the adoption of the RRT politically more difficult.

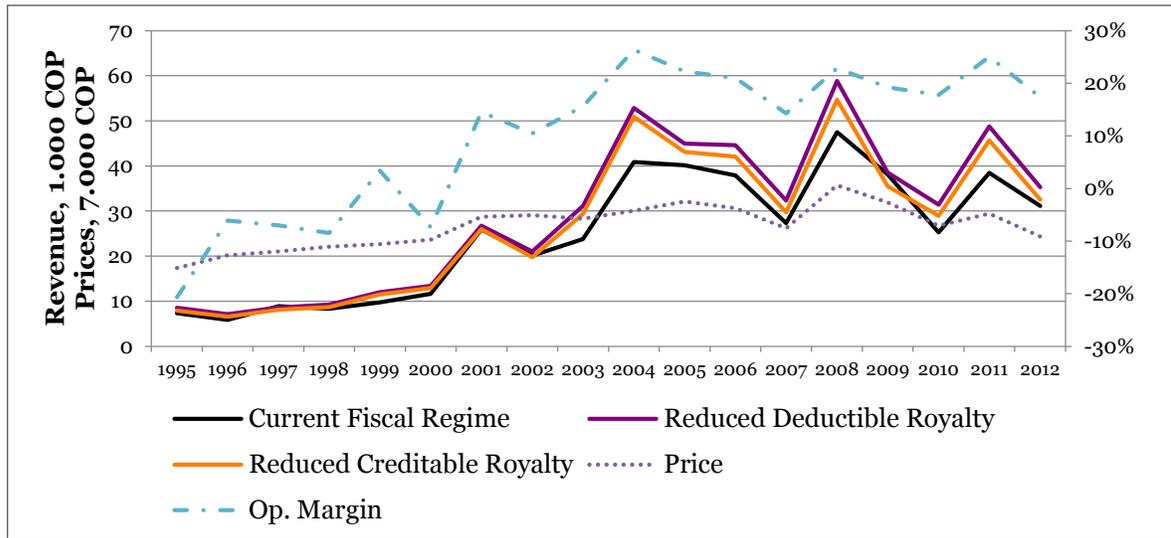
Assessing Revenue Performance of Alternatives

We present below simulations of how total mining revenues would have behaved in the 1995 to 2012 period if Colombia had enacted since 1995 a resource rent tax on net operational cash flow minus net investments and an uplift rate of six per cent (equivalent to the government long-term bond rate) for accumulated losses, again under the assumption that production decisions would not have been altered. We begin by simulating a 30 per cent RRT rate under the assumption that the RRT and the CIT are independent (neither deductible nor creditable against each other). We consider two levels of royalty rates (a reduced flat three per cent or five per cent rate across all minerals and contracts), which would be deductible from CIT as at present, and two alternative treatments for royalty payments under the RRT: (1) royalty payments are deducted as any other cash flow expense; (2) royalty payments are creditable against payable RRT (or act as a minimum RRT payment).

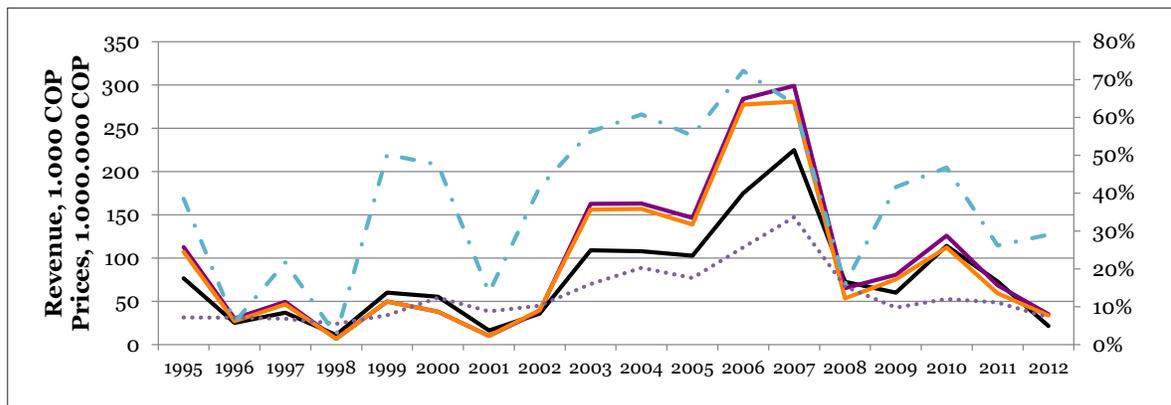
Figure 3 compares the actual total taxes (royalties and income tax) paid by ton or troy ounce produced by the largest Colombian coal, nickel and gold mines from 1995 to 2012, against what total taxes (RRT, royalties and income tax) would have been if an RRT had been in operation with creditable reduced royalties (at three per cent for all minerals). Again, these estimates do not take into account the probable larger investments, production and cash flows that would have been obtained under the alternative RRT-cum-lower-royalty regimes. Hence our estimated revenues under the alternative RRT-cum-reduced-royalty regimes should be considered a lower bound for the period under review. Table 8 summarizes the increases in present value of total revenues during the period, for all cases considered, under these restrictive assumptions.

FIGURE 3 TOTAL REVENUES PER PRODUCTION UNIT³¹ INTRODUCING RRT ALTERNATIVES

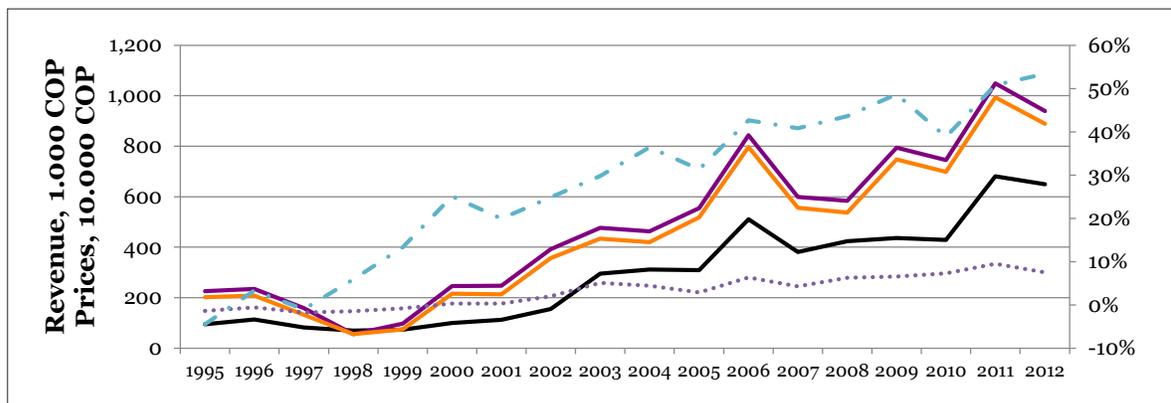
Coal



Nickel



Gold



³¹ Coal and nickel in tons, gold in troy ounces.

TABLE 8 PRESENT VALUE* OF TOTAL FISCAL REVENUES: 30 PER CENT-RATE RRT ALTERNATIVES

	Sectorial Change in Revenue Under Different Regimes			Total Revenue** (Three Sectors)			
	Coal	Nickel	Gold	Resource rent tax	Corporate income tax	Royalty	Total
<i>Current fiscal regime</i>	0%	0%	0%	0	17.76	20.90	38.66
<i>RRT with deductible reduced royalty</i>	17.41%	31.00%	67.11%	18.95	22.86	5.10	46.91
<i>RRT with creditable reduced royalty</i>	-5.05%	19.05%	53.19%	16.27	22.86	5.10	44.23
<i>Sectorial operating margin***</i>	20.48%	31.92%	43.62%				

* Present values were calculated using a six per cent real discount rate.

** Figures are expressed in 2012 billions of pesos.

*** Five-year average.

The main results can be summarized as follows: the present value of total revenues would have been larger in all minerals, as a consequence of a significantly higher capture of the high rents obtained during the 2003–2012 period. Increases would have of course been higher in the cases in which royalties are deductible from the RRT, in comparison to the cases in which they are fully creditable against the RRT.

Revenue increases would have been significantly larger for gold than for nickel, and more modest for coal. These differences by subsector reflect once more that gold is probably undertaxed in Colombia, while royalties for large coal contracts are high when judged either by international standards or relative operational margins, as already observed above.

A word of caution on these results: The fact that we obtained a higher present value of revenues in all simulations with a 30 per cent RRT-cum-reduced-royalty structure is probably highly period-specific for two reasons. First, prices and operational margins were unusually high from 2003 up to 2008 for the three minerals, and even higher from 2009 to 2012 for gold and coal. Second, all the large mining companies in Colombia, upon which these simulations are based, made their initial investments long before 1995. As a consequence of both factors, results would have probably been very different if we had had access to data on operational cash flows, investments and royalties from since these companies started exploration and development of their first mines. Further, due to these facts, results for the 1995–2012 period with an uplift rate of 12 per cent, including a “risk-adjustment” factor, do not change much. Such a result would have been quite different if we could extend the simulation back to 1980 to cover the high initial development investments.

Nonetheless, what the simulations show beyond doubt is that an RRT-cum-reduced-royalty structure would have captured a much higher fraction of windfall earnings, in comparison with what the present regime did, while at the same time significantly reducing efficiency costs, as shown in the previous section.

In Table 9 below we present estimates of present-value revenue increases for the period 1995–2012 with different RRT rates depending on the treatment of royalty payments (whether deductible or creditable) and CIT payments (independent or deductible). Simulations presented were based on a reduced royalty rate of five per cent, as those with a three per cent RRT rate required excessively high RRT rates for obtaining similar revenue effects. From these results, and taking into account only revenue objectives, authorities might consider keeping a common royalty rate of five per cent and introducing either a 25–30 per cent CIT-independent RRT with deductible royalty payments, a 35–40 per cent CIT-independent RRT with fully creditable royalty payments, or a 45–50 per cent RRT with fully creditable royalty payments and deductible CIT payments. However, as shown in Table 7 above, while the second case

(i.e., Option B) would give between a common 26.1–29.4 METRR for all minerals (for a 35 or 40 per cent RRT rate, respectively), the first one (i.e., Option A) would give much higher METRRs and with a significant variation across minerals. Thus, between these two options, and combining efficiency and revenue concerns, we would recommend a 35–40 per cent rate RRT with fully creditable royalty payments. When considering Option C, Table 7 showed that we would obtain a 12.6 per cent METRR for all mineral activities, regardless of the RRT rate. Thus, combining efficiency, competitiveness and revenue objectives, this would indeed be a much superior alternative. However, as said before, it would be considerably more administratively demanding and the higher required rate for revenue purposes (45–50 per cent instead of 35–40 per cent) could make it more difficult to be politically accepted.

TABLE 9 SIMULATED INCREASES IN THE PRESENT VALUE* OF REVENUES DURING 1995-2012 IF ALTERNATIVE DESIGNS OF RRT HAD BEEN IN PLACE

Coal	Independent CIT		Deductible CIT (Option C)	
	Royalty Rate	PV revenue increase	Royalty Rate	PV revenue increase
Royalty is deductible (Option A)	20%	-0.47%	30%	-2.87%
	25%	12.20%	35%	1.59%
	30%	17.41%	40%	6.05%
Royalty is creditable (Option B)	30%	-5.05%	40%	-0.99%
	35%	0.68%	45%	3.82%
	40%	6.42%	50%	8.63%

Nickel	Independent CIT		Deductible CIT (Option C)	
	Royalty Rate	PV revenue increase	Royalty Rate	PV revenue increase
Royalty is deductible (Option A)	20%	13.05%	30%	11.71%
	25%	22.03%	35%	16.96%
	30%	31.00%	40%	22.64%
Royalty is creditable (Option B)	30%	19.05%	40%	15.99%
	35%	27.93%	45%	22.26%
	40%	36.80%	50%	28.54%

Gold	Independent CIT		Deductible CIT (Option C)	
	Royalty Rate	PV Revenue Increase	Royalty Rate	PV Revenue Increase
Royalty is deductible (Option A)	20%	42.75%	30%	44.62%
	25%	54.93%	35%	53.05%
	30%	67.11%	40%	61.48%
Royalty is creditable (Option B)	30%	53.19%	40%	51.62%
	35%	66.23%	45%	61.20%
	40%	79.26%	50%	70.78%

* Figures are expressed in 2012 pesos and were carried forward using a real discount rate of six per cent.

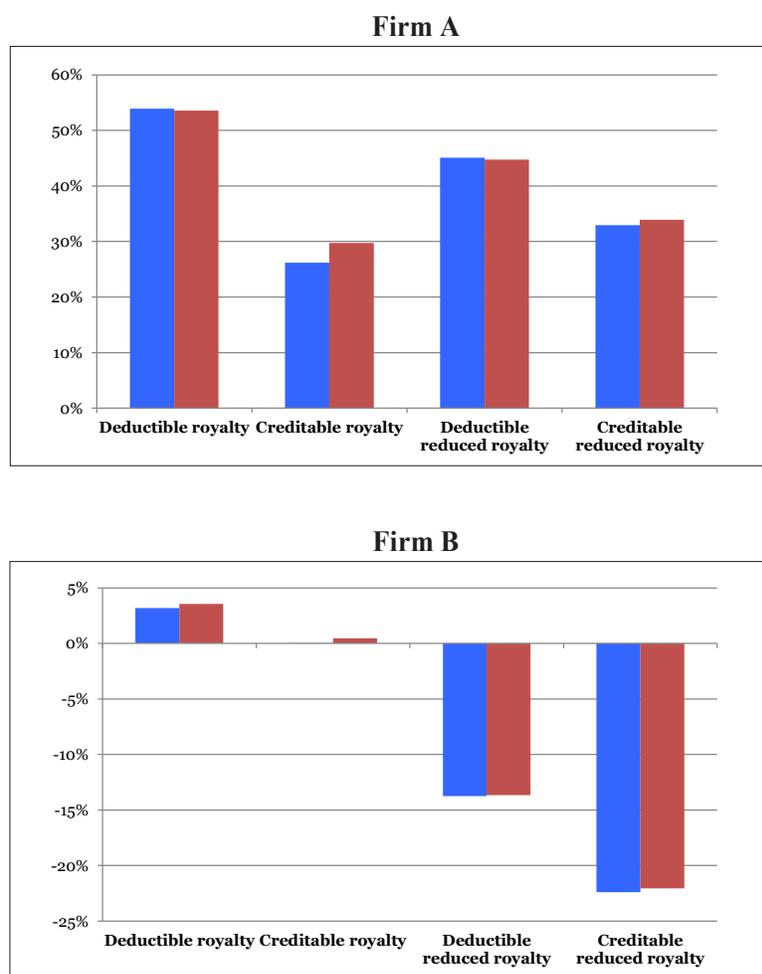
Dealing with Revenue Risks

In this section we illustrate some revenue risks inherent in the proposed system. Figure 4 illustrates what would have happened with the present value of revenues of the three largest coal companies if different alternatives for an RRT had been in place. These companies pay similar royalties per ton today, but their

CIT per ton is quite different (Figure 5). While Firm A's tax liabilities would have increased in all cases with an RRT, Firms B and C would have had a significant reduction in total payments when royalties are reduced. It is hard to understand why firms with similar royalty payments per ton, and relatively similar costs of production, would pay such different CIT rates and RRT per ton, unless there are problems with tax enforcement that allow wide differences in transfer prices³² or other accounting practices affecting reported operational margins.

Figure 5 also shows that the absence of ring fencing would not have been a serious problem in the case of Firms A and B (as they each manage essentially one large project, though through more than one subsidiary and concession contract), while it would have significantly reduced RRT and overall tax liabilities in the case of Firm C, which has several smaller projects in operation.

FIGURE 4 INCREASES IN PRESENT VALUE OF TOTAL TAX PAYMENTS WITH SOME RRT ALTERNATIVES. TAXING COMPANIES PER SUBSIDIARY OR PER CONSOLIDATED GROUP



³² In several interviews it was suggested that low transfer prices to trading companies in tax havens are a common practice for some companies.

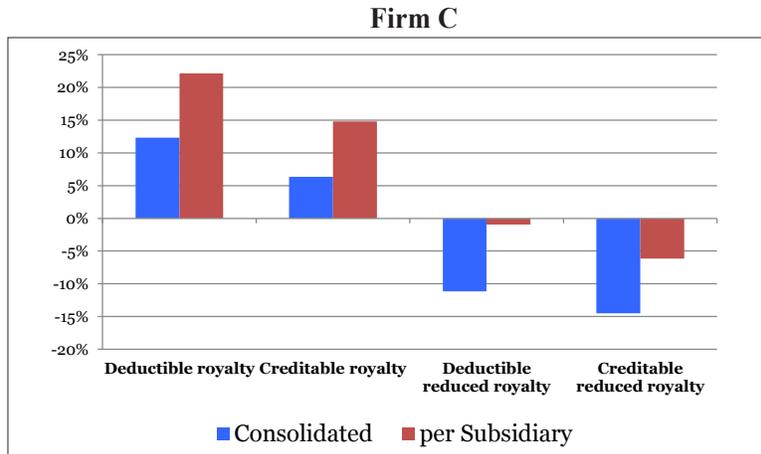
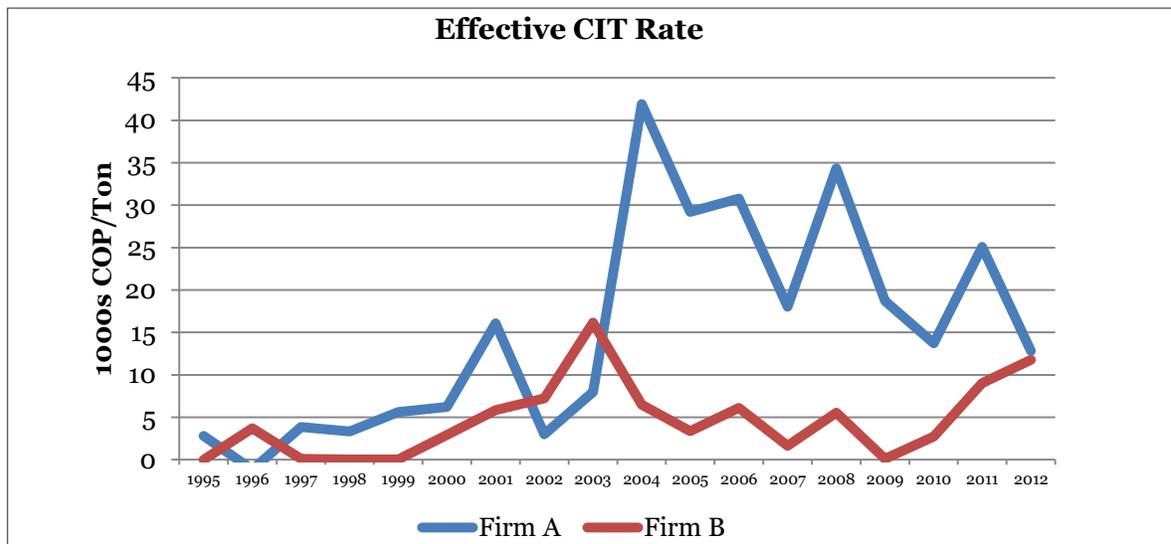
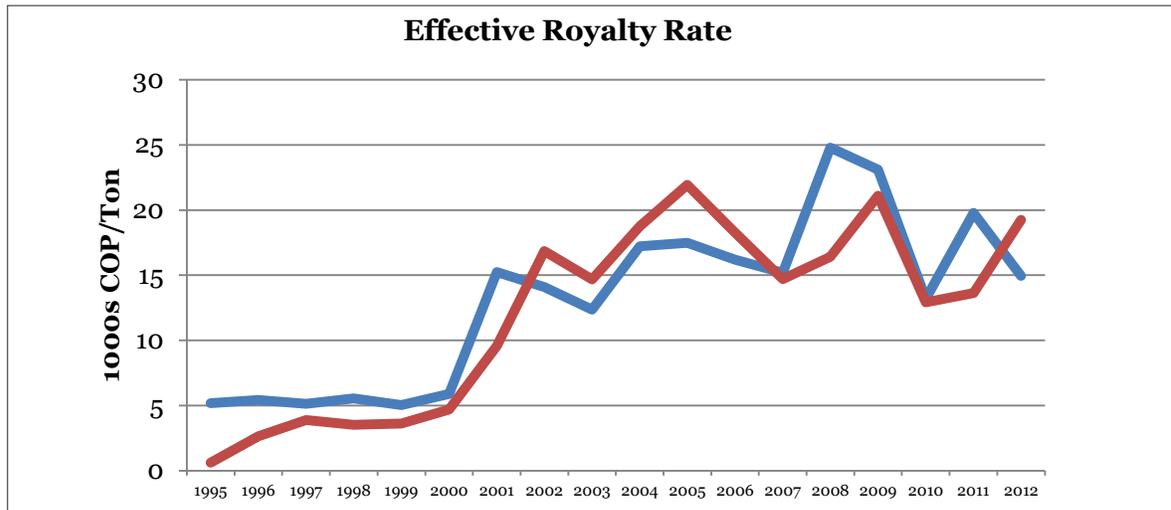


FIGURE 5 EFFECTIVE ROYALTIES AND CORPORATE INCOME TAX PER TON PAID BY THE SIMILAR COMPANIES



6. CONCLUSIONS AND RECOMMENDATIONS

The main conclusion of this paper is that, by introducing a resource rent tax, and reducing royalty rates to a common five per cent across minerals, the Colombian mining tax regime could gain significantly in efficiency and in competitiveness with other mining countries, while at the same time significantly augmenting fiscal revenues during price booms (when operational margins increase sharply), especially from the most profitable mining projects. Though mining fiscal revenues would diminish in periods of low prices, it appears that such a reduction would be more than compensated by their increase in periods of high prices. A cautionary note is in order, though: The tax authority needs to be able to better control transfer pricing and other accounting practices that affect both CIT and RRT collections, as otherwise the reduction in royalties (where those problems are presently less of an issue, as discussed in Section 2) may imply a significant tax liability reduction for companies that engage in such practices.

As for RRT-design issues, we would suggest that authorities consider either a 35–40 per cent CIT-independent RRT with fully creditable royalty payments, or a 45–50 per cent RRT with fully creditable royalty payments and deductible CIT payments. Both options would avoid efficiency distortions on investment across minerals and improve competitiveness with other countries, while capturing significantly higher revenues in good times and from highly profitable mines. These two alternatives present a trade-off between efficiency/competitiveness effects (being significantly superior for the second option) and administrative/political concerns, being less significant for the first option.

Ring fencing by mining project would be desirable, as otherwise some companies may in the future significantly reduce the RRT payments from mature mines when developing new mines, which could lead to inefficient over-investment decisions and would put them at a competitive advantage vis-à-vis other companies. However, we would recommend permitting expensing of unsuccessful exploration expenditures in order to promote higher exploration investments (which may have positive informational externalities associated with them). Ring fencing by mining project would however complicate even further the administrative complexities of the second option discussed in the previous paragraph and raise a difficult issue in cases of large expansions of existing projects.

We would further recommend using a “risk-free” uplift rate for accumulated RRT losses, given that, by design, the government shares risks with private investors under an RRT regime. That said, it is likely that companies will lobby for a higher “risk-adjusted” uplift rate, as they have done elsewhere, but the government should be aware that such a choice is not a rational one (as explained in Section 2) and may significantly reduce RRT proceeds from new projects.

The most difficult issues in the Colombian context would be of a political economy nature, given that royalty revenues are fully allocated to sub-national jurisdictions, including both producing and non-producing ones. Thus, congressional representatives from large coal- and nickel-producing areas could fiercely oppose a reduction in the royalty rate³³ unless the RRT proceeds are also fully allocated to sub-national governments. In the latter case however, the national government may not have enough incentive to push forward a reform that would be in any case politically contentious. The way out of this conundrum could be a compromise along the following lines:

- The RRT would be established as a new national levy applying only to new mining concessions. At the same time, royalty rates would be fixed at a common five per cent for all new mining concessions and their proceeds would be credited against the RRT. In this way, sub-national governments with large nickel and coal mines would not face a reduction of present revenues as a consequence of this legal reform. The new regime could also be applied to extensions of present concessions or expansion

³³ The royalty rate would not be lower than at present for base metals, gold and small coal mines.

of their area of exploitation, by mutual agreement. In such cases, full accounting of the rent—the accumulated cash flow, net of all the mining cost, including all the capital investment associated with such extension or expansion—should be required.

- The proceeds from the RRT would be shared between the national government and currently producing regions, as these regions have already suffered a significant recent reduction in their share (since the 2011 reform), and thus would be the most likely to oppose the reduction of royalty rates. Moreover, most currently producing regions also have potential for new mining ventures (for instance La Guajira or Cesar), and hence would be the most interested in such a sharing provision.

APPENDIX:

THE EFFICIENCY IMPACT OF DEDUCTING THE NET CIT PAYMENT FOR RRT PURPOSES

In this paper, we studied the efficiency impact of mining taxation in Colombia using the classical marginal effective tax rate (METR) or marginal effective tax and royalty rate (METRR) analysis. And we use these two terms, METR and METRR, interchangeably depending on whether the METR includes any mining-specific levies such as a resource rent tax (RRT).

By definition, METRR is the proportional wedge between the gross-of-tax-and-royalty rate of return to capital (RG) and the net-of-tax-and-royalty rate of return to capital (RN). That is, $METRR = (RG - RN)/RG$.

For the general METRR model applied in this paper, Chen and Mintz (2013) provided a technical appendix. In that appendix, assuming the conventional taxing approach that *allows mining taxes or royalties to be deducted for corporate income tax (CIT) purposes*, the basic formula for the gross-of-tax-and-royalty rate of return to capital, or RG, for depreciable assets is the following:

$$RG = (r+\delta)[(1 - UZ - \tau(1-U))] / [(1-U)(1-\tau)] - \delta \quad (1)$$

Where, r = real financing cost, δ = the economic depreciation rate, U = the CIT rate, Z = the present value of accumulated annual tax depreciation allowance, and τ = the rate of any type of mining levies such as the conventional revenue-based royalty or the more efficient rent-based tax.

In this paper, along with a METRR simulation for the conventional taxing approach, used under the current system (as formatted in equation (1) above), we provide two alternative options for introducing a rent-based mining tax, or resource rent tax (RRT). The first one is a seemingly independent RRT that has no interaction with the CIT in an administrative sense; that is, the RRT and the CIT are not deductible for, or creditable against each other in either direction. The equation for RG corresponding to this first approach is the following:

$$RG = (r + \delta)(1 - UZ - \tau) / (1 - U - \tau) - \delta \quad (2)$$

Since the annual tax depreciation allowance is normally below 1 and hence $Z < 1$, the term $(1 - UZ - \tau) / (1 - U - \tau)$ is greater than 1. As a consequence, the RG with both non-zero CIT rate (U) and RRT rate (τ) will always result in an "unintended" interactive tax impact despite the fact that they are "independent" from each other in an administrative sense.

In other words, even such a supposedly "nul" administrative interaction between RRT and CIT leads to a tax burden interaction between the two because their tax bases are overlapped. As shown in Equation (2) and verified through our modeling, without the CIT, the METR impact of any RRT is zero. This is because, by definition, the rent should be zero at the margin, and so should be the RRT and its investment impact at the margin. But with CIT in the model as formulated in equation (2), it is evident that the METRR will rise as the RRT rate rises (by the first derivative), and the METRR will rise at an increasing rate compared to that for the RRT (by the second derivative). A similar logic applies to the conventional approach formulated in Equation (1).

To avoid such an efficiency loss, we propose the second option that would allow the *net* CIT payment to be deducted from the tax base for RRT. By “net,” we mean the RRT rate should be reduced by the CIT rate (U) while the RRT allowance should be reduced by the CIT allowance (UZ). The equation for this administrative interaction (to eliminate the overlap between CIT and RRT) can be formulated as the following:

$$RG = (r + \delta)[1 - UZ - \tau(1-UZ)] / [1 - U - \tau(1-U)] - \delta \quad (3)$$

Rearranging Equation (3), we have:

$$RG = (r + \delta)[(1 - UZ)(1 - \tau)] / [(1 - U)(1 - \tau)] - \delta, \text{ which becomes}$$

$$RG = (r + \delta)(1 - UZ)/(1 - U) - \delta \quad (4)$$

Equation (4) is the equation for RG without RRT that is applicable to any sector; this equation, as derived from Equation (3), indicates a METRR that does not change with the RRT rate. Such a rent-based tax would have no impact on capital investment at the margin since the rent is zero at the margin and hence the RRT should be zero as well.

In conclusion, allowing the *net* CIT payment to be deducted for RRT purposes helps ensure the ultimate efficiency intended by the introduction of RRT: only the rent generated from resource extraction is taxed under RRT and no RRT is levied at the margin when no rent is generated.

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ISSN

1919-112x SPP Research Papers (Print)
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